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Thirty-Second Annual Convention 163

Adaptation to Delayed Sidetone
WILLIAM R. TIFFANY AND CLAIR N. HANLEY 164

Intelligibility as Related to the Path of Airborne Side-Tone
JOHN W. BLACK AND GILBERT C. TOLHURST 173

Peer Evaluation of Children in Speech Correction Class
GERALD G. FREEMAN AND JAMES A. SONNEGA 179

Analysis of the Games Technic
MARTHA E. BLACK AND RUTH ANN SOKOL LUDWIG 183

Ohio County Fair Hearing Survey
JOHN J. O'NEILL 188

Relationship Between Severity of Stuttering and Word Conspicuousness
WILLIAM D. TROTTER 198

Parental Environment of Stuttering Children
A. C. LAFOLLETTE 202

On Predicting the Intelligibility of Speech From Acoustical Measures
KARL D. KRYTER 208

Analog Studies of the Nasalization of Vowels
ARTHUR S. HOUSE AND KENNETH N. STEVENS 218

Effect of Voice Quality on Communication
CHARLES F. DIEHL AND EUGENE T. McDONALD 233

Status of Five Front Consonants in the Speech of Cerebral Palsied Children
PURA M. FLORES AND ORVIS C. IRWIN 238

Effect of Phonic Training on Speech Sound Discrimination and Spelling Performance
EMPRESS YOUNG ZEDLER 245

Book Reviews 251

Abstracts 256

News and Announcements 273

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Adaptation To Delayed Sidetone

William R. Tiffany

Clair N. Hanley

The recent use of delayed sidetone as a clinical test for auditory malingering has raised many questions concerning the nature of individual differences in resistance to the disturbing effects of delayed speech feedback. Many observers have no doubt noted that at equivalent sensation levels of delayed sidetone, speakers vary markedly in behavior. For example, Hanley and Tiffany (*3*) found that at a 50db level one subject required 43.3 seconds to read a passage which he read without sidetone in 32.2 seconds. On the other hand, another subject in this same study read the passage in 36.2 seconds without sidetone but was able to read it in 34.6 seconds under the distortion condition. Not only did subjects differ with respect to reading rate but there also seemed to be marked differences in rhythm, fluency, and other manifestations of speech disturbance.

When the delayed sidetone is used to detect auditory malingering, it is important not only to assess the nature and degree of individual differences among subjects with equivalent experience, but also to evaluate the possible alterations in behavior arising from learning. It is possible that a malingerer may avail himself of the literature concerning this test and become practiced, or learn to overcome, during the course of the test, the distorting effects on his speech.

It seemed advisable, therefore, to study the adaptation to the distorting effects of delayed sidetone. This study investigated differences among subjects as well as differences within subjects over successive readings.

William R. Tiffany (Ph.D., State University of Iowa, 1951) and Clair N. Hanley (Ph.D., State University of Iowa, 1952) are Assistant Professors of Speech, University of Washington.

Procedure

In order to investigate the question of adaptation, 20 naive, normal hearing subjects read an easy, 45 word, prose passage 24 times under a condition of approximately 80 db SL of sidetone with a sidetone delay of .18 second.

A sensation level of 80 db was chosen as a level which would have a marked influence on the speech of the average listener, while at the same time not being so intense as to produce undue disturbance from the loudness factor alone. The sensation level of 80 db was produced by monitoring the intensity of the sidetone at 80 db above the recorded spondee recognition threshold. A delay of .18 second was used because this amount had been found by Black (*2*) to produce a maximum disturbance in reading rate.

Successive reading trials were distributed as follows: four successive readings, a 15-second pause, four more readings, a second 15-second pause, followed by a third group of four readings. A second group of 12 readings with the same practice distribution was carried out one week later. It was hoped that in this way both short and long-time learning effects could be assessed. The readers were instructed that it would be their task to maintain their reading pattern as nearly normal as possible regardless of what they heard in their earphones.

In order to investigate the adaptation in a factor not previously explored, a new measure of delayed feedback speech disturbance was used—a 'fluency break' count. Breaks in fluency resulting from delayed sidetone typically appeared to consist of syllable and word repetitions or omissions. Therefore, an independent estimate of the number of such repetitions and omissions was made by each of two observers for both the delay and the normal conditions. Instructions to the observers were simply to count, for each reading, the number of breaks in fluency which resulted from syllable, sound, word, or phrase repetitions or omissions. This task proved to be a fairly simple one for the observers who showed very good agreement in their counting ($r = .98$).

In order to investigate the possible correlates of the speech response to delayed sidetone, a measure of general speech effectiveness and a measure of fluency were obtained for each of the subjects of the study. This was done as a first and exploratory attempt to discover whether ability to resist delay distortion was part of the general picture of individual differences in speech excellence. The measure of 'fluency' consisted simply of a count of the fluency breaks in the normal readings which preceded the sidetone readings in this experiment.

The measure of 'general speech effectiveness' consisted of mean scale values representing a general effectiveness rating by a class of beginning speech students. This measure had been obtained about three weeks earlier as part of a classroom experiment in voice preference. The speech sample judged was a short neutral descriptive prose passage, different from that used in the sidetone experiments. The measures constituted a score on a four-item scale. The items, empirically selected for high intercorrelation and high reliability, were as follows:

1. Does this person have an intimate, informal, conversational way of reading?

2. Would you characterize the articulation as clear and distinct?

3. From the sound of the voice alone would you judge that this person is a dominant type, accustomed to leading others?

4. From the sound of the voice alone do you think you would like to know this person better?

Twenty naive, beginning speech students rated each speaker on each item on a five point equal-appearing interval scale, from 'Yes. As much as possible, to 'No. Not at all.' Full scale reliability for the total of all four items was about .96.[1]

A number of more or less interrelated measures are available as possible indices of delayed feedback effect. Among these, the following

[1]A more complete description of this scale and a report of its use is being prepared for later publication.

were used: (1) fluency breaks under delayed sidetone conditions; (2) reading time under the delay condition; (3) 'long-time' adaptation: the difference in average reading time between the first and second week's sidetone trials; and (4) 'short-time' adaptation: the difference in average reading time between the first and the third groups of four readings during a single sidetone series.

In order to investigate the effect of high level delayed sidetone on normal readings which directly followed the feedback experience, the 24 experimental readings were both preceded and followed by a series of 12 normal readings, without amplified sidetone. Each series of normal readings was arranged with similar practice distribution. It was hoped that a comparison of the pre-sidetone readings with the post-sidetone readings would reveal whether or not the disturbing experience of reading under delayed feedback conditions had any facilitating or retarding effect on the reading rate, or any disturbing effect on fluency.

The instrumentation for this experiment consisted of a Presto RC 10/24 tape recorder with a mechanical adaptor for variable sidetone delay (*5*), an Electrovoice model 650 microphone, MacIntosh amplifier (20W), variable attenuators, and PDR-10 phones. The talker, microphone, and earphones were located in a sound isolated room. The observer and amplifying, attenuating, and recording equipment were located in an adjacent room.

The data of the experiment consisted of durational measures of all readings, in seconds, obtained by averaging the stop-watch timing of two observers, the 'fluency break' count, and the ratings of speech effectiveness, previously described.

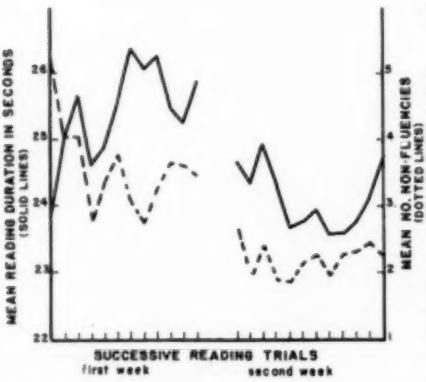

FIGURE 1. Mean adaptation curves for reading duration and reading 'fluency' compared. The upper curve represents the mean duration of 20 speakers for each successive reading. The lower, dotted curve represents the mean number of 'fluency breaks' averaged over all 20 readers for each successive reading.

Results

Reading rate adaptation. There appears to be no significant adaptation in reading speed during a series of 12 feedback readings. Analysis of variance revealed an F of less than one for the 12 successive readings of the first week as well as for those of the second week. Further, a t test is not suggestive of significant differences between the means of the first and second series of readings, insofar as the duration variable is concerned (t is 1.428). A test of the significance of the duration differences between the last reading of the first week and the first reading of the second week also did not allow for rejection of the null hypothesis (t equals 1.019).

Fluency adaptation. An examination of the 'fluency' data shows that from

one week to the next there occurred a marked and statistically significant decrease in the number of 'fluency breaks.' For the total of the first series of twelve readings under the delayed sidetone condition there was a mean of 42.7 fluency breaks. This compared with a mean of 26.2 for the readings of the following week. The difference was significant at the two per cent level of confidence. For the case of adaptation within a single series of 12 readings the conclusions were not so clear. Differences were slight and did not appear to be significant.

Figure 1 compares the adaptation curves for the time and fluency measures. Despite the fact that the trends shown within groups of readings were not of statistical significance for either type of measure, and despite the fact that differences between groups (weeks) were not significant for the exceedingly variable time measures, this figure is presented to suggest relationships for possible future exploration. It will also serve to summarize the basic data of the experiment.

In general, the two types of difficulty, rate change, and fluency change, tended to go together, although the relationship was not a particularly strong one. When averaged over all 12 readings for the first sidetone series, reading duration and fluency were found to be positively and significantly correlated ($r = .72$) for the 20 readers. For the readings of the second week, duration correlated .39 with fluency breaks. This difference in relationship from the first to the second week's readings seems to indicate further that significant adaptation over the interval studied takes place in only one of the measured aspects of the sidetone disturbance. On the whole, readers may learn to avoid the 'stuttering' but not the change in rate.

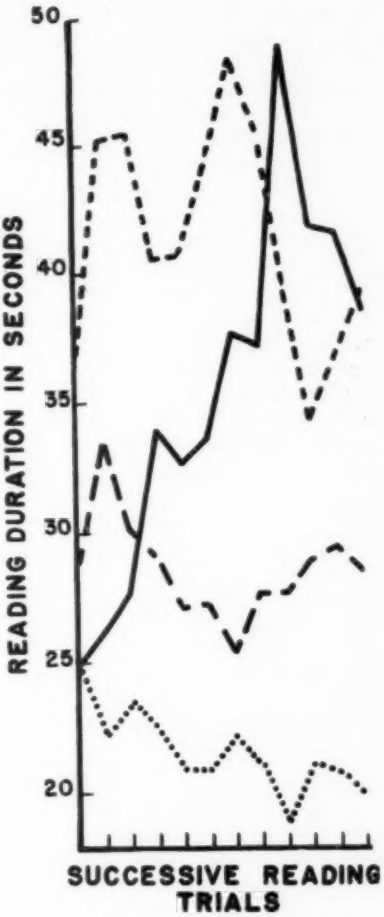

FIGURE 2. Examples of four selected adaptation curves chosen to illustrate the extreme range of variability among subjects. Each curve is for a different subject. Successive reading trials are for the first week (trials 1-12) only.

Individual differences. Statistical analysis of the variance attributable

to subject and trial error shows very large amounts of variation probably resulting from individual differences among subjects. One of the most notable of the findings of this experiment concerns the fact that individuals approach the difficult reading task, represented by the sidetone disturbance, in markedly different ways, and with considerable variation in the amount of success which meets their efforts. A comparison of the individual adaptation curves for the first series of 12 readings shows that for the first four repetitions of the test passage ten readers showed noticeable increases in reading speed while ten showed decreases. The range in mean reading times for the first series of sidetone readings was from 17.23 seconds to 41.43 seconds (sigma, 6.85). For the case of fluency breaks, the range was from none to 157, total for the 12 readings. Figure 2 shows examples of the extreme variability to be encountered in the learning curves. The four curves chosen for this figure represent some extreme cases for purposes of illustration. Curves are for the first day's readings only.

An analysis of variance among normal reading trials showed little variation and no significant adaptation (F was less than one). The mean normal reading time for the 12 successive trials varied from 16.08 to 16.92 seconds with a mean of the means of 16.43 seconds and no consistent trend. Variation among subjects was very slight in comparison with the sidetone readings. Reading times varied from 14.23 to 19.35 seconds (sigma, 1.09).

Relation with reading ability. The analyses of the relationships between measures of the severity of speech distortion and measures of speaking ability produced mixed and seemingly contradictory, but at the same time interesting, results. The 'fluency' measures showed no statistically significant relation to measures of speech distortion. On the other hand, the judgmental rating of 'general effectiveness' correlated—.48 with reading time adaptation over readings 1-12. This correlation coefficient was significant at the five per cent level of confidence. Thus, there is suggested an inverse relationship between speaking ability and ability to overcome delay distortion. On the other hand, a correlation of .25 between the week-to-week adaptation and speech effectiveness seemed to indicate that the better speakers may learn to overcome the rate distortion in the long run. The correlation of .25 was not statistically significant, however. General effectiveness ratings appeared to be related only to the adaptation measures. The correlation coefficients between the ratings and measures of average 'fluency breaks' and reading time were .02 and —.05 respectively.

Influence on post-sidetone reading. Because it was felt that the disturbance caused by the difficult reading task might have an influence on the subsequent normal reading performance, the reading rates and fluency for the two normal readings were compared. No significant change was found in mean reading time. However, there was a significant difference in fluency, the second normal reading showing fewer errors than the first. An average of 2.62 nonfluencies for the 12 readings of the pre-sidetone series compared with an average of .55 for the post-sidetone readings. The difference was significant at the two per cent level. It seems likely that the difference is to be attributed to the interim practice.

It is not possible, of course, to tell whether or not the sidetone itself had any influence on the learning.

There are some data from this study to suggest that where the reaction to delayed sidetone was severe, particularly in terms of rate retardation, subsequent normal reading rate was decreased. On the other hand, it was found that readers who experienced only a slight 'speech upset' possibly tended to speed up in their post-sidetone reading. This relationship is inferred from the significant correlation between (1) the amount by which the mean of the second normal readings differed from the first, and (2) the mean duration of the readings under the sidetone condition. For the first series of sidetone readings the correlation was .63 and for the second .64. Taken together with the fact of no difference in average post-sidetone rate change this would seem to indicate that there is generalization of disturbance in cases where the task has been a particularly difficult one for readers, and facilitation where the task has not resulted in gross speech distortion.

Discussion

With respect to the major question of this study, whether the reader can learn to overcome the effects of delayed sidetone, the answer, for the amount of practice employed here, must be negative. In the case of only four readers, when noticeable adaptation took place in the normal readings, did any of the delayed sidetone readings show less reading time than the slowest of the normal readings. Of the 480 readings for all readers and all conditions of delayed sidetone only three were read at a faster rate than the average normal reading time for each subject. In every case the 24th sidetone reading took longer than the average of the normal readings, and in every case the average sidetone reading was longer than the average normal reading. This would seem further to validate the use of the rate measure as a means of determining feedback effect. However, the exceptions which were found indicate that as a clinical technique for the detection of auditory malingering and/or psychogenic deafness, it would be better to administer a number of trials for normal and sidetone readings and to base the decision on the average tendency as being a good deal more stable.

The non-significant findings with respect to rate adaptation are, of course, not to be construed to mean that no adaptation to sidetone speech disturbance takes place. It has been the experience of clinicians who work frequently with sidetone, and who have much more extended opportunities for practice, that it is possible in the long run for many speakers to overcome most of the effects of the delayed feedback. Because of the short interval studied in the present experiment, the rate adaptation results are not necessarily inconsistent with those of Atkinson (*1*) who found a small, though statistically significant, rate adaptation to sidetone for practice periods of one hour a day for 10 days. Nor does the fact that little or no rate adaptation can be demonstrated in the present study imply that no important learning in other aspects of the reading response has taken place. The results of this study seem to show that the readers do learn to overcome, to some extent, the most bizarre of the symptoms of delayed sidetone disturbance, the 'stuttering'

or non-fluency; though this may, for some, be done at the expense of reading rate. Even here, however, there can be no doubt that the average non-fluency on the 24th feedback reading was significantly greater than zero.

It would seem likely that the degree to which the response is subject to distortion would depend not only upon the aspect of the response measured but also upon the type of signal employed. Informal tests and observations lead to the tentative conclusion that voiced, whispered, and whistled signals may be employed in that order of difficulty. As yet, no subject has been found who is capable of whistling in a normal fashion under high levels of delayed sidetone. Significant hypotheses concerning the relative importance of different types of speech cues and the importance of bone conducted and kinesthetic cues should be formulated and tested.

With respect to the variability found in the data of this study, the results would seem to support the contention that the sidetone test of malingering must be employed with the utmost caution. These data, together with the authors' clinical experience with this type of testing, prompts the suggestion that extreme conservatism be used where the test is employed as a critical test in the detection of malingering. It appears to be true that when a clear-cut reaction to the delayed sidetone does occur, its bizarre and compelling nature is such as to give the clinician great confidence that the subject does indeed hear the sidetone. However, where even the slightest doubt is felt by the clinician the lack of a noticeable reaction on the part of the subject should not be taken as incontrovertable evidence of true organic hearing loss. It is urged that conservatism in applying the sidetone as a test of malingering be taken to mean that it would be better to have the test fail to detect a few clever malingerers rather than to have it misdiagnose the case of true organic hearing impairment.

With respect to the question of individual differences, it appears that the manner in which the subjects learned to resist delay distortion is related to their general speech effectiveness as judged by an audience of naive listeners. The data which show the relationship between speaking ability and adaptation, although somewhat inconclusive, pose a number of interesting theoretical questions with regard to the basic speech process. Is the more successful speaker more willing to talk slower, less willing to be non-fluent? The present results would seem to suggest this. Does the better speaker 'listen' to himself more carefully and thus make more important use of the auditory feedback channel? This, too, would seem a hypothesis worth investigating.

It would seem that the delayed feedback situation can be thought of as one which threatens the fluency of the speaker. In this sense, then, there has been artificially produced a specific speech anxiety setting. Each speaker, confronted by a competing signal, may resist or adapt his speech behavior in conformance with certain pre-determined speech habit patterns or personality traits. For example, Spilka (*4*) has noted that persons showing paranoid behavioral tendencies reacted to the sidetone by significant vocal intensity increases, whereas other subjects who were classified as having schizoid modes of behavioral adjustment reacted in direct con-

trast to the paranoid subjects. Conceivably, delayed sidetone situations may yield still more important experimental evidence bearing on the speech personality patterns and speech abilities of the individual. Further research along these lines may result in important contributions to the field of speech.

One of the most interesting, if not the most reliable, results of this study, concerned the reaction of a single subject in the post-sidetone reading. This subject had experienced increasing difficulty with the sidetone readings, particularly on one word—pony. Following the delayed sidetone readings, he continued to experience great difficulty with this word even though no sidetone delay was present. He exhibited stuttering-like symptoms, as though the experimental readings had produced a kind of specific anxiety for this word. He not only appeared to be more non-fluent than before the side-tone experience but also appeared to show tension and avoidance behavior consistent with accepted descriptions of stuttering patterns. The result raised the interesting question as to whether or not temporary stuttering could be experimentally induced in other cases in this way, and if so by what mechanism it is brought about.

The data presented in this study possibly shed light on some contradictory evidence from previous studies regarding the extent to which effects of the sidetone carry over into the subsequent normal reading conditions. The data of Hanley and Tiffany (*3*) apparently showed no carry-over because of the relatively short readings and the low intensity levels of feedback involved. On the other hand, the data of Black (*2*) obtained with intensity levels of feedback more comparable to those of the present study did show a tendency for post-sidetone readings to be slower than normal. The relation between carry-over and rate effect found in this study would tend to reconcile these apparently contradictory studies, at least in part. Whether facilitation or retardation is experienced following delayed feedback appears to depend upon the nature or severity of the sidetone experience.

Summary

Twenty normal hearing subjects were subjected to 80 db of delayed sidetone during 24 readings of a 45 word prose passage, primarily to determine the degree to which the speech distortion effects could be overcome. Twelve successive readings were given the first week, 12 the following week. Measures of reading time and reading fluency, and related measures of speaking ability showed the following:

1. There was no significant adaptation in reading rate over the interval studied.

2. There was, however, a significant adaptation in fluency from the first series of readings to the second series one week later. In general, readers learned to avoid the repetitions and omissions of words, syllables, and sounds, but did not learn to overcome the rate effect.

3. Adaptation trends were obscured by marked individual differences. Some readers grew markedly worse while some markedly improved over the successive trials.

4. There was a significant negative correlation between judged reading

ability and adaptation within the first series of 12 readings. That is, the 'better speakers' appeared not to overcome the rate distortion of speech as quickly as the poorer speakers. This correlation was not found for fluency, however.

5. There was a tendency for the generalization of feedback disturbance in subsequent normal readings to be related to the amount that the speaker was disturbed. Speakers who had been badly disturbed by the delayed sidetone tended to read more slowly following this experience, while speakers who were little disturbed showed an increase in reading rate.

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Intelligibility As Related To The Path Of Airborne Side-Tone

John W. Black

Gilbert C. Tolhurst

Side-tone derives from both sound transmitted through bone-tissue and from sound that arrives at the ear by way of direct and reflected air paths. The relative importance of the two channels to the speaker remains a topic for study. Bekesy (*1*) hypothesized that the impacts upon the cochlea of the internally conducted sound and the externally conducted sound are of about the same order of magnitude. Fry (*8*) summarizes another view, 'When we sing or speak, most of the sound which we ourselves hear is conveyed to our ears by bone conduction.'

Fletcher (*6*) determined experimentally that the sound pressure level of voice varies inversely with the level of feedback to the external ear. He worked in the context of telephony and the outcome was stated in terms of the decrement to the voice signal of unit lengths of telephone wire. His result was confirmed and extended by Lightfoot and Morrill (*10*). These investigators required talkers to read multiple-choice word intelligibility lists (*9*) to panels of listeners through a simulated aircraft intercommunication system. The level of side-tone was systematically altered; the level of vocal output was determined by a power level recorder that was calibrated with a General Radio sound level meter, and intelligibility scores were determined from the listeners' response to the spoken materials. Both vocal sound pressure level and intelligibility varied with alterations in the level of side-tone. Within the range of side-tone level explored, there was no departure from linearity in either the sound pressure level of the voice or the intelligibility scores of the speaker as a function of the relative level of side-tone.

The relationship between sound pressure level and intelligibility, generally monotonic, is well established (*5*, *7*). It is usually determined in a microphone-headset situation and the results are stated relative to voltage at the listener's earphone; except at unusual levels, the highter the voltage, the higher the intelligibility. The difference in sound pressure level that occurs at the listener's ear as he is near or distant from a speaker in an auditorium is akin to a voltage dif-

John W. Black (Ph.D., State University of Iowa, 1935) is Professor of Speech and Director of Speech Science at The Ohio State University. Gilbert C. Tolhurst (Ph.D., State University of Iowa, 1948) is a Research Associate at the Acoustic Laboratory, U. S. School of Aviation Medicine. This study was conducted at the U. S. Naval School of Aviation Medicine, N.A.S., Pensacola, Fla., under a contract between the Office of Naval Research and the Ohio State University Research Foundation.

ferential at an earphone; and intelligibility scores can be stated as a function of this separation distance (*4*). Indeed, it is odd that currently one would feel obliged to explain speaker-listener separation as having aspects in common with voltage in the determination of intelligibility scores. Fletcher and Steinberg (7) defined their orthotelephonic system as one that would match free-room articulation scores *at a specified distance.*

The sound pressure level of oral reading has been found to vary in rooms of different sizes and reverberation times (*3*). In this instance, the changes in a talker's sound pressure level may be attributed to environmental circumstances that affect the external side-tone channel. Sound pressure level has also been found to vary with temporary changes in auditory threshold that accompany prolonged exposure to noise (2). In this instance, the responsiveness of the hearing mechanism is altered with respect to both external and internal feedback channels.

In the foregoing instances, the level of speech was found to vary (a) as a function of the voltage of the side-tone at the earphone, (b) as a function of the reverberation characteristics of a room, and (c) as a function of the momentary threshold of the ear. Although the level of speech is closely related to intelligibility, this criterion was used only in the measurements of the effects of varying the voltage of the side-tone. The object of the present study was to find whether systematic alterations of the path of airborne side-tone might induce sufficient changes in the voice of the oral reader to affect his intelligibility. The inquiry did not pertain to drastically unusual circumstances; rather to quiet surroundings, relatively minor changes in the path of the side-tone, and conditions that would be associated with easy, not difficult communication. The variables included (a) the binaural application of insert type ear defenders by the speakers, (b) monaural applications of ear defenders with the open ear alternately facing and not facing a reflecting surface, (c) the conditions of (b) with the normal noise of the room present, and (d) large convex and concave acoustic reflectors whose reverse sides were flat positioned one foot from the head, one on one side, one on the other.

Procedure

This study was comprised of four independent parts conducted sequentially.

The testing room was a corridor 84 feet long, 100 inches high, and 84 inches wide. The ceiling was sound treated, the sides were of hard plaster, and the floor of polished wood. At one end of the corridor, two facing doors led to a sound-treated chamber and to an office respectively. With the air-conditioning unit and a water cooler operating, the noise level of the testing room was 68 db (General Radio meter; C scale); with the units turned off, the level was reduced 13 db. The air conditioner and water cooler were off during the experimental procedures except in Part III, when they remained on as an experimental variable.

Twelve panels of 15 experimental subjects participated in each of the four parts of the study, 720 subjects in all. The 15 members of a panel sat in tablet armchairs, spaced at intervals

of four feet and backed against one wall of the corridor. The speaker's position was equally spaced from the two doorways and from the end of the hall, and was 20 feet removed from the nearest listening position. The 12 experimental subjects in each panel who sat nearest the speaker's position served as speakers and read multiple-choice intelligibility tests (*4, 9*) under standard instructions for a round-robin administration of the test. The remaining three subjects in each panel served solely as listeners.

Part I. Both doors, the one to the office and the one to the sound room (two reflecting surfaces) were closed. The speakers read one speaker list from Form A or B of the multiple-choice tests. Alternate speakers read while wearing insert-type ear protectors. After the 12 members of a panel had read once, the program was repeated with the alternate half of the speakers wearing the ear-defenders. Forms A and B of the multiple-choice intelligibility tests were used first and second in rotation with successive panels.[1]

The assumption under test was that the blocking of the airborne side-tone and the concurrent amplification of bone-conducted side-tone would affect vocal level and intelligibility scores. The former condition might be expected to induce louder talking and the latter, softer talking.

[1]The experiment had one further variable. Half of the subjects wore the V-51R ear defender, and the remaining half wore the Lee Sonic 'Ear Valv'. Although numerically the mean intelligibility scores for panels were consistently higher when the speakers wore the 'Ear Valv', this difference was not statistically significant, *t*, 1.26 (30 d.f.). Hence, the two sets of scores were pooled and the present summary treats only speakers with ear defenders vs. speakers without ear defenders.

TABLE 1. A comparison of the mean intelligibility values of speakers reading in free-room conditions. Part I: N, 144, reading with and without binaural occlusion; Part II: N, 144, reading with monaural occlusion; Part III: N, 144, same as Part II with normal constant room noise present; Part IV: N, 144, reading with one ear facing a concave *vs.* convex reflecting surface, and the other, a flat surface.

	Part I	*II*	*III*	*IV*
a. Open ears	87.5	87.4	86.1	86.0
b. Open ear facing reflecting surface		88.6	86.4	84.1
c. Open ear facing 'non-reflecting' surface		89.1	85.9	86.2
d. Binaural occlusion	90.7			

Results of Part I. The speakers were assigned higher intelligibility scores when they wore ear defenders than when they did not. The mean scores are summarized in column one of Table 1, 90.7% *vs.* 87.5%; *t*, 3.80 (30 d.f.). It seems possible to infer that the 'attenuators' in the airborne channel were more effective than the 'amplifier' of the bone-tissue channel. This conclusion arises from an assumption that a modification in vocal sound pressure level was responsible for the difference in scores.

Part II. The 'polished' door to the office was closed; the door to the sound room was open, giving a reflecting surface to one ear and an absorptive 'cavity' to the other. The reader stood midway between the two doorways. Each reader read two intelligibility lists in the manner of Part I. Half of the speakers read first in an open-ear condition, and second in a

condition of monaural occlusion. Half of the monaural occlusions were in the ear that faced the 'polished' door and half were in the ear that faced the sound room.

The assumption was that the reflecting door would increase the level of airborne side-tone, and thus would result in decreased vocal sound pressure level and intelligibility if airborne side-tone is the major factor which guides the speaker in setting vocal level.

Results of Part II. The mean intelligibility scores of the subjects in the two conditions are enumerated in column two of Table 1. The 1.7% difference between *open ears vs. open ear facing 'non-reflecting' surface* was significant at the 1% level of confidence (t, 2.75; 71 d.f.). An overall comparison between *open ears* (first row in Table 1) yielded a significant difference at the 1% level of confidence (t, 2.80; 143 d.f.). These observations are offered. The significant increment in intelligibility occasioned by an open ear facing a 'non-reflecting' surface is understandable. The speaker had to talk louder to seem natural to himself. The opposite effect would have been expected, however, when the open ear faced a reflecting surface. Instead, this condition gave the same result as *open ears*. Presumably an interaction between one 'blocked' channel and one amplified channel resulted in cancellation of effects.

Part III. The conditions of Part II were repeated with the constant normal noises of the hallway present, air-conditioning unit and water cooler on.

Results of Part III. The mean intelligibility scores are enumerated in column three of Table 1. There was no significant difference between the mean values of the two conditions. However, it is evident through a comparison of the values of columns two and three that the listeners assigned higher scores to the speakers under the quiet condition than they did to speakers who spoke in the presence of the room noises.

Part IV. Concave and convex cylindrical reflectors were fashioned by shaping one-half inch plywood to a 40-inch radius arc enclosed on the reverse side by a flat surface four feet wide and three feet high. The concave 'box' was enclosed on the ends and at the top and bottom, and the convex 'box' was enclosed on the top and bottom. All surfaces were painted, yielding efficient acoustic reflectors.

The order of Parts II and III was repeated with a concave surface 12 inches from the right ear, and a convex section 12 inches from the left ear, in place alternately to vary the experimental conditions. In the control conditions, both flat surfaces of the reflectors were 12 inches from the ears, and when a convex or concave surface faced one ear, a flat surface remained 12 inches from the other ear. The air conditioning unit was off and both doors were closed.

The following effects were hypothesized: (a) the comparison airborne level of side-tone would be set by the condition of the two flat sides of the reflectors; (b) when one convex side was turned toward an ear, the contralateral ear, facing a flat surface, would monitor side-tone for the speaker and there would be no change in the speaker's vocal level or his side-tone; and (c) when a concave side was turned toward an ear it would serve as a focusing reflector, increase the level at the speaker's ear,

and produce a reduction in speaking level and intelligibility.

Results of Part IV. The mean intelligibility scores of the experimental conditions appear in column four of Table 1. The values in rows *a* and *c* of column four indicate that with one ear facing a flat reflector, and the other facing a sound-dispersing reflector, there was no significant change in intelligibility from the circumstance in which both ears faced flat reflectors. However, when one ear faced a concave reflector the airborne side-tone was probably increased and when compensated for by the speaker mean intelligibility scores were attenuated significantly, 1.9%, *t*, 2.59 (71 d.f.) and 2.1%, *t*, 2.83 (142 d.f.).

Discussion and Summary

Intelligibility scores are certainly related to other factors of voice than sound pressure level. They are, however, related to level, and the changes in scores that were effected by altering the path of the airborne side-tone were presumably attributable to variations in vocal level.

Two circumstances that might be expected to affect vocal sound pressure level operated among the different conditions within particular parts of the study: (a) the occluding of the ear canal, and (b) the altering of the proximate reflecting surface.

It has been stated that occluded ear canals should increase the level of bone-tissue-conducted side-tone (*11*). If this were the major cue for the monitoring system, a reduced sound pressure level might be expected in the level of speech and a consequent reduction in the intelligibility score. This did not occur, as shown by the values of Part I in Table 1; nor is such a decrease consistent with behavior that is observed when a talker dons an inoperative headset. Hence, it must be assumed that under circumstances like these, speakers derive their monitoring signal importantly from the airborne side-tone.

If the airborne side-tone is the signal that a speaker monitors in setting vocal level, *etc.*, one would expect no difference in voice level between an open-ear condition and a condition in which only the ear away from a proximate reflecting surface is occluded. A difference would be expected, however, when only the ear facing the proximate reflecting surface is occluded. These suppositions are borne out in the results of Part II. In this event, the cue to restoration of 'normal voice' is related to the acoustic efficiency of proximate reflecting surfaces.

Comparisons of values within each row of Table 1 hold only incidental interest. The effect of the room noise of the air conditioner was to attenuate the listening scores from the comparable scores of columns one and two. This effect cannot be assigned entirely to a change in speaker performance, for the listener would have been affected by the same noise background.

Similarly, the mean scores for each experimental condition of Part IV (column four) were significantly lower than the scores of columns one and two of Table 1. The flat reflectors near the ears would be expected to increase the level of airborne side-tone. The normal adjustment to this condition would be a reduced level of speaking and reduced intelligibility scores. This reduced vocal effort is reflected in the results.

The negative results of Part III may

suggest that in a noise environment of 68 db, the side-tone signal that is monitored is the sound that follows the direct path from the mouth to the ear. However, this portion of the study introduces aspects of signal-to-noise ratio that are beyond the scope of the present treatment.

The viewpoint that was suggested relative to monaural occlusion receives confirmation in the results of Part IV. The level of normal speech was apparently the same whether flat reflecting surfaces were proximate to both ears, or only one flat surface was present and the other was replaced by a sound-dispersing unit. However, when a focusing unit was used in conjunction with a flat one, the resulting intelligibility scores were reduced.

The criterion intelligibility scores indicated that speakers adjust their level of 'natural' reading in quiet to maintain a more or less constant monitoring experience from the airborne components of side-tone.

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Peer Evaluation Of Children In Speech Correction Class

Gerald G. Freeman

James A. Sonnega

It is generally assumed that a speech handicap is necessarily a social handicap—that a speech disorder tends to reduce the social acceptance of a child (*1*). Intrinsic in this philosophy is the belief that defective speech is an important factor in determining how a child is evaluated by his peers. It was the purpose of this study to seek objective evidence which might support or refute this belief.

Since participation in classroom affairs is one of the most important interpersonal experiences of children, the study was conducted in the public schools where the peer evaluation of the elementary school child is made and where his classroom reputation is established. The project was designed to compare the classroom reputation of children enrolled in speech correction classes with that of children who were not thus enrolled. Three hypotheses were tested: (1) If children who attend a speech correction class are regarded differentially by their peers because of impaired speaking ability, they will be chosen less often to participate in a speech-oriented project when the criterion for selection is predominantly speaking ability. (2) If children who attend a speech correction class are evaluated by their peers as being in some way socially unacceptable, they will be chosen less often to participate in a speech-oriented project when the criterion for selection is predominantly friendship. (3) If children who attend a speech correction class are regarded by their peers as being socially unacceptable, their peer ratings in relation to certain traits of social acceptability should reveal discrimination.

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Procedure

Children in five elementary classrooms were used in the study. Three of the classrooms were third grade level rooms and two were fourth grade level rooms. A total of 133 children were enrolled in the five rooms at the time of the study; 26 of the children were attending a speech correction class. In the analysis of the data obtained, the results from each classroom were pooled and interpreted as if gathered from a single room with 133 members.

A uniform testing procedure was used in each classroom. The following instructions were read:

> A group of us teachers is interested in finding out what boys and girls of your age like to do after school. I would like to talk to each of you if I could, but that would take too much time. So I thought that if I could talk with some of you, about five, I could get an idea of what you like to do after school. Since I don't know you, I thought your class could choose the five people to talk with me. I planned to record the conversations so that I can have a good record of what you say. It would be better if the five people you choose are good speakers, because if they can talk well, probably they will do a better job on the recording. Each one of you choose the five people you think will do a better job on the recording.

These instructions were intended to encourage the children to make their choices predominantly on the basis of speaking ability.

After the papers were collected, the following instructions were read:

> In other classes where I have done this, I have found that there may be ties in choosing the five speakers to represent the class. So, in order to help me, would you choose the five people with whom you are most friendly and can work with the best?

These instructions were intended to get the children to make their choices predominantly on the basis of friendship.

Bonney (2) found the following ten traits to be reliable indicators of social acceptance: leadership, enthusiasm, daring, tidiness, activeness in recitation, good looking, frequent laughter, happy, friendly, and welcomed. A modification of the 'guess who' technique was used to get the children to choose classmates who possessed these traits. Such questions were asked as: 'Who knows how to start games or other things that boys and girls like to do?' (Leader) and 'Who always has a good time and has fun doing everything at school?' (Enthusiasm) Similarly, questions characterizing the eight other traits were asked.

In order to be sure that the verbal definitions of the selected traits would be meaningful to third and fourth graders, it was necessary to make a slight modification of some of the original questions as set forth by Tryon (*3*). The test procedure was modified further by requesting the children to make three choices in relation to each of the ten traits instead of one. Each child's choices totaled 30—three guesses on each of 10 traits.

In analyzing the speaking ability and friendship data, it was decided to impose a scale on each set of five choices. The value of the choice position was inverted so that a first choice received a weighted value of five, a second choice a weighted value of four, and so on down to a fifth choice which received a weighted value of one. By tabulating the number of choices at each of these five positions, it was possible to compute a 'Speech Score' and a 'Friendship Score' for every child.

Each set of three choices on the 'guess who' test also was scored with an inverted value scale—a first choice received a weighted score value of three points, a second choice a weighted score value of two points, and a third choice a weighted score value of one point. By tabulating the number of times each child was chosen for each of the three positions within a trait, it was possible to determine the child's score for that trait. The total of such scores on all the traits was then treated as the 'Trait Score' for each child.

TABLE 1. Comparison of mean scores for children not in a speech correction class and children in a speech correction class on 'Speech,' 'Friendship,' and 'Social Acceptability Traits.'

		Mean Scores		
	N	*Speech*	*Friendship*	*Traits*
Children not in a speech correction class	107	15.15	14.27	51.96
Children in a speech correction class	26	8.31	12.35	45.58
t Ratios		4.32	0.91	0.81
Level of significance		>1%	<5%	<5%

Results

Analyses of differences between mean scores earned by the children in speech correction class and those who were not in speech correction class are shown in Table 1. When the two groups were compared on the three sections of the experiment, it was found that the children in speech correction class, as a group, received significantly lower 'Speech Scores' than did the children who were not in speech correction class. However, the two groups received essentially the same mean scores on the dimensions of 'Friendship' and 'Social Acceptability Traits.' The difference between mean 'Speech Scores' for the two groups attained significance at the one percent level of confidence, while the other two differences in mean scores failed to reach statistical significance. In addition, the children who attended speech correction class received, as a group, significantly higher 'Friendship Scores' than they did 'Speech Scores.' It was possible to reject the null hypothesis of no difference between means at the one percent level of confidence.

Product moment correlations between scores on the three dimensions were computed separately for the children who attended speech correction class and for those who did not, as well as for the two groups combined. The correlation between 'Speech Scores' and 'Friendship Scores' for the children not in a speech correction class was found to be significantly higher than the same correlation for the children in a speech correction class (1% level). The correlations between 'Friendship' and 'Traits', and 'Speech' and 'Traits' were found to be essentially the same for both groups of children. The comparatively high correlations for the total group ('Speech'-'Friendship' = .72, 'Friendship'-'Traits' = .72, and 'Speech'-'Traits' = .82) were corroborated by the results of an analysis of the scores earned by the 25 children who received the highest 'Speech Scores.' It was found that these 25 'chosen speakers' received significantly higher 'Friendship' and 'Trait' scores than did the rest of the total group. In both instances, it was possible to reject the null hypothesis at the one percent level of confidence.

Conclusions

According to the data collected, children who attend speech correction class are chosen less often by their peers when the basis for selection is predominantly speaking ability. This seems to indicate that the speech defective children in the sample were recognized as having impaired speaking ability.

The data did not disclose that the children who attend speech correction class were chosen less often by their peers when the basis for selection was predominantly friendship. This seems to indicate that the speech defective children in the sample enjoyed a comparable degree of friendship within their classrooms as did the other children.

The data did not disclose that the children who attend speech correction class were socially less acceptable as indicated by a comparison of 'Trait Scores'. This seems to indicate that the children with speech defects in the sample are essentially as well accepted by their peers as normal speakers.

In view of the above conclusions, it is believed that general statements regarding the social acceptance of speech defective children should be made cautiously. According to this study, there is no basis for assuming that speech defective children are socially rejected merely because of their speech.

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Analysis Of The Games Technic

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Games are loved by children of all ages. Wise teachers have recognized this fact and have taken advantage of it to improve their work. In all likelihood the speech correctionists, more frequently than others, have used games as valuable tools. Their judicious use increases efficiency and adds interest, motivation, and variety to teaching.

However, it should be emphasized that the game is merely one means to an end and its performance is not the prime objective of a speech correction lesson. If the game is to serve a real speech purpose, it must be examined carefully before it is used. There are various criteria by which a game may be evaluated in terms of its usefulness to a speech correctionist.

Better Speech. Students come to the speech class to improve their speech; the game is incidental. The introduction to the game should emphasize the opportunities it offers for the child to have further practice in the speech he is learning. Any prize, reward, honor, or recognition should be given because of discernible improvement over the child's own previous speech performance. At the conclusion of the game, attention should be focused on the true objective and accomplishment—better speech.

Relevance. The game should meet the immediate and specific speech needs of the individual child. Whether it involves an exercise to strengthen muscles of the speech mechanism, the telling of a story inspired by an action picture, or a drill on a list of words, a game can be of therapeutic value if it fits logically into the development of a pupil's speech. If a child is working to increase the mobility of the muscles of the soft palate, then blowing games may be employed. However, it is pointless to use a blowing game if the pupil is working on the correction of a sound in which oral pressure is not involved. On the other hand, it is not wise planning to prepare a game calling for specific word or sentence responses when the previous therapy had stressed only lip and tongue exercises, or sound recognition and discrimination drills. The brief time allowed for a public school correction program should not be dissipated by drilling a child on a sound he already has mastered or on one for which he is not ready.

Frequency of Speech Opportunities. The game should be such that it will not elicit just random talking, but rather that it should make possible practice on the child's particular

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speech problem. The game should be evaluated carefully to assure each participant a satisfactory number of turns to work on his speech. A game in which the child recites his sound or word only when a spinner indicates his color, or number may result in an unfair division of time and opportunity. Also, little satisfactory speech progress is made when a child participates in a game in which he may make several responses, but only one or two of which are focused on his specific problem.

The game should be simple to operate and the instructions should be clear.

Mastered Vocabulary. Games involving written words cannot be used with a child who is a non-reader. The games which he will enjoy are those employing objects or movement. However, when a speech correctionist is preparing written word games for those children whose reading skills are developing, the vocabularies in the basic texts at each grade level may well serve as guides. It may be wise to use the vocabulary of one level below the grade placement, because children do not enjoy games which require a struggle to recognize words. Moreover, the short time allocated for speech correction in a public school program does not allow for the teaching of reading in the speech class. This is all the more reason why the vocabulary used should be familiar.

Educational Practices. Little time will be wasted in the playing of a game involving written or printed symbols if the symbols used are those with which the child is familiar. Caution should be exercised to insure a left to right eye sweep in all game activities. This will help to establish the habit patterns which are being developed with the child's reading and writing training. For example, when a teacher wishes to have a child determine whether he hears a sound at the beginning, middle, or end of a word, she may draw a short train on the chalk board. Such a train may consist of three parts, the engine, the passenger car, and the caboose (the beginning, the middle, and the end). The train should always point to the left so that the initial sound coincides logically with the engine and is in accordance with the left to right eye sweep.

Likewise, speech teachers should take cognizance of the basic concepts which govern the development of art education. If the child is asked to identify outlined pictures of objects whose names contain his sounds, he may circle or check the pictures rather than color them. No direction should be given which would tend to destroy a child's capacity for original expression by offering him opportunities to rely upon adult imposed concepts of shape and form.

Interest Appeal. Among the many things primary children love are repetition, color, and movement. A game involving the handling of just one or two colorful objects and the repeating of the same activity over and over may be completely satisfying to the very young child. Also, he may like to make use of his imaginative powers and to identify himself with characters or animals from stories. These interests should be utilized.

Usually the intermediate child no longer cares for make-believe without purpose. He is becoming aware of the world about him. He may like games which require skill, which follow definite rules, and which may involve

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the tallying of scores. He may like puzzles, riddles, jokes, puns, and games which involve adventure. He might enjoy a small, well-planned crossword puzzle which is focused on the sound with which he has difficulty. Also, he may like guessing games. Most intermediate pupils enjoy taking sides. At this stage it is important that the rules of the game be observed completely. This is the age for the letter as well as the spirit of the law. Since time is precious, problems which involve too long a period of thinking should not be used in the speech class.

Students on the secondary school level may like guessing games, such as "What's My Line?" and "Twenty Questions." These games center on subjects of general interest, such as current affairs, vocations, and careers. At this age there is a division of interest on a boy-girl basis. Usually boys like games calling forth their knowledge and skill in mathematics, science, and sports; girls may enjoy more the games concerning personal appearances, social graces, or the movies. But most students like games involving mystery and games which allow them to identify themselves with popular heroes, such as stars in the sports field or leading performers in the entertainment world. Also, they may appreciate games which center about their current school subjects and problems. Whatever the age of the pupil, his interest should be considered; however, his speech needs never should be forgotten and should receive prime emphasis in the planning of the game.

Individual Differences. Knowledge of ability level helps the speech correction teacher in her selection of games. At the primary level, attention spans are short. It is unwise to present several objects, pictures, words, or ideas simultaneously to the young child. Moving toward the top of a speech ladder having only six, five, or even just two rungs may constitute a sufficient game challenge for some children. The games used with primary pupils must be simple ones, which employ only one activity and one line of thought.

Caution must be exerted to avoid a complication of activities which may be beyond the child's comprehension. For example, when a pupil is asked to use the train as a visual symbolization of sound order, he must indicate whether he hears the sound in one of the three positions by pointing to the proper portion of the train—the engine, passenger car, or caboose. Actually, this process consists of three activities—listening for the sound, deciding where it occurs, and then transferring this knowledge to the visible picture of the train. Although this might be done readily by a bright child, a slightly slower primary boy or girl might find it a difficult and confusing activity.

When a young child is asked to select from among many pictures on a page the objects whose names have his sound, too many choices may cause difficulties. A page containing one or very few pictures of well known objects simply drawn and presented in strong primary colors is a much more effective teaching device than is a page containing a multitude of minutely drawn and daintily colored pictures. For older children, the objects and colors may be more complex. Effort should be made to have the pictures at the child's level of appreciation.

The ability of each child in the

speech group must be taken into account. A game composed of a vocabulary geared to the brightest child in the lesson group may be too difficult for the slowest child. This fact may re-focus his attention, and that of the rest of the group, from better speech to his inadequacies. Of equal importance, of course, is the need to stimulate the bright child to do his best possible work. Then, too, there may be a small number of children for whom games are too stimulating. When this situation is suspected, psychological advice should be sought. There are two main components to the playing of a speech game—the game itself and, more important, the participants.

Integrating Classroom Work. The various academic subjects taught at each grade level afford rich sources for game ideas. For example, when United States geography is being studied, a game employing the map of the United States might be prepared for the speech class. The child may travel from city to city. Geographical names can be put on bingo cards. If Eskimo, Indian, or circus units are studied, a number of games can be derived from these vocabularies. Possibly, a short crossword puzzle in the shape of an igloo, tepee, or circus tent might be used.

Arithmetic, too, can be a rich vocabulary source for games. When fractions are being stressed, the child who lisps or has indistinct speech may profit from a game involving 'thirds,' 'fourths,' 'fifths,' or 'sixths.' Addition, subtraction, multiplication, and division, all can lend themselves to game activities. Intermediate or junior high boys who are hard to interest often consider arithmetic games challenging and worthy of attention.

The word lists in the spelling books can be utilized in a variety of ways, such as bingo, flash cards, or ladder games.

History, science, music, geography, art, as well as sports, home economics, and industrial arts, all yield vocabularies for the creation of speech games. Stories from literature and ideas from units on the farm, the home, the community, the visits to the fire house, the zoo, and the bakery are valuable as resource materials for games. Opportunities for the integration of the speech work with that of the classroom are endless.

Competition. The dangers as well as the values of the competition which speech games create should be weighed carefully by the correctionist. The winning of a game for the sake of excelling over others never should be the prime objective. One child may grasp sound discrimination more readily than another who in turn may have less difficulty in producing the sound. Therefore, it is important to stress the idea that working to improve one's own previous speech accomplishments is far more commendable than is striving to beat a classmate.

The harmful psychological effects of too much competition may be as evident in speech class as in any other situation. Speech teachers must be aware of this. Their games must keep the goal of better speech uppermost in the minds of all their pupils. If the game calls adverse attention to the child, then the game is not good for him.

Variety. Sometimes the speech class bears the reputation of being the place where games are played. As was stated previously, the game is only one of several instructional aids to be used

by the speech correctionist and it should take its logical place in the improvement of the child's speech. After a firm foundation has been built, the game frequently serves as a clincher exercise and gives variety to drill practices. A speech game may consume an entire speech period, but some speech correctionists find that having a work period (auditory training, motokinesthetic stimulation, mirror work, and word drills) prior to the playing of a short game develops a genuine teaching and learning situation and, of course, gives variety to the lesson.

The same game, even with variations, seldom can be used for every child in an entire day's program. The work involved in planning and creating new games never ceases. Presenting the same one to the same group every time a game is employed reduces the interest of the pupils in coming to the speech class. The speech correctionist, too, should enjoy the game. To repeat the same game all day long with group after group, even though a few changes are made for different grade levels, is sheer boredom for the teacher. Whatever vigor and enthusiasm she may have been able to put into the first few games grows rather wan by the end of the tenth.

Preparation. A practical teaching tool is one that can be created easily and used a long time. Speech correction teachers are busy people and preparing the speech game is only one of their many tasks.

Because of the short time allowed in the public schools for speech correction, using the pupil's speech class time to make game materials is never to be considered. No speech progress is made while the pupils are cutting, pasting, coloring, or painting. The game should be planned and prepared before the correctionist meets with her class. Games do not have to be complicated or to consist of time consuming devices to be interesting. However, they must be well thought out if they are to accomplish defensible objectives.

In conclusion, the speech room never should be thought of only as a place where games are played. Rather, it should be respected as a place where pupils concentrate on speech. Although the game has a place in the correction of most speech defects, it cannot replace the fundamental teaching which pupils with speech problems may need. The game is one of several technics used to achieve the goal of improved speech. It is that portion of the whole program of speech therapy which affords an opportunity to use the new speech with some element of joy and fun.

Game ideas exist in abundance among public school speech correctionists. For that reason, no attempt has been made to describe definite games to be used in the speech class; rather this has been an effort to organize some thoughts which may assist in the selection and preparation of materials. Games which meet all or most of these criteria will be helpful accessories to sound teaching.

Ohio County Fair Hearing Survey

John J. O'Neill

County and World's Fairs have served as the setting for two large scale hearing surveys. The first of these was conducted at the New York and San Francisco World's Fairs in 1939 by Steinberg, Montgomery, and Gardner (*3*), and the second at the San Diego County Fair in 1948, by Webster, Humes, and Lichtenstein (*4*). These surveys utilized pure tones which were presented from phonograph discs.

In 1951 the Ohio Department of Health, in the interests of hearing conservation, public health, public relations, and education, inaugurated a hearing testing program at county fairs. During the summer of 1951, hearing surveys were conducted at the Clinton, Greene, and Fayette County Fairs. The hearing tests consisted of audiometric pure-tone screening and threshold tests. These tests were administered in a two-room, sound treated, mobile trailer. The results of the survey were reported by Foladare (*1*). In the summer of 1952, the testing program was extended to cover nine county fairs and the State Fair. The present paper reports the results of this testing, as well as a comparison of the results with those obtained in the preliminary 1951 survey.

It was felt that the county fair setting would allow for a sizeable sampling of the hearing loss patterns of residents of particular counties. It was understood that such a sampling could not be considered as being representative of the hearing loss pattern of residents in the entire state of Ohio. However, such a large sampling would allow for a comparison of the hearing pattern of a part of the Ohio population with that of other states.

John J. O'Neill (Ph.D., Ohio State University, 1951) is Assistant Professor of Speech, The Ohio State University. The testing program was organized and expedited by Dr. Margot Hartman and Mr. Crayton Walker of the Division of Child Welfare of the Ohio Department of Health. Mrs. Helen M. Morrison of the same department assisted in the tabulation and sorting of the test data.

Procedure

The tests were administered in a sound treated, mobile trailer which contained two testing rooms. The larger of the rooms (Room A) had an ambient sound level of 46-50 db. The smaller room (Room B) had an ambient sound level which ranged from 40-42 db. These levels were measured by means of a General Radio sound level meter (Model 759-B), C scale. The quoted levels were the result of a series of measurements at several of the fairs while the trailer was in place for testing.

The testing procedure included pure tone screening and threshold tests. Binaural earphones were used for all tests. The screening test utilized a Maico H-1 group audiometric

TABLE 1. Distribution of subjects by county and sex.

County	*Total Tested*	*Male*	*Female*
Ashland	269	124	145
Clinton	298	143	155
Delaware	106	43	63
Fairfield	230	85	145
Greene	292	113	179
Huron	214	65	149
Madison	158	79	79
Montgomery	190	106	84
Muskingum	485	245	240
State Fair	745	341	404
	2987	1344	1643

setup with 10 listening stations. When individual screening tests were performed, two Maico F-1 audiometers served as the testing instruments. Threshold rechecks were made with a Maico E-1 audiometer and two Maico F-1 audiometers.

The screening tests were administered in the large test room (Room A), while threshold checks were given in the small test room (Room B). During the course of testing at the 10 fairs, a team of six hearing consultants was employed.[1] Usually the test team was made up of three consultants. All of the consultants were trained in the use of a similar testing technique. The technique employed for both screening and threshold tests was that suggested by Newhart and Reger (2). The majority of the tests were administered between the hours of 1:00 p.m. and 10:00 p.m. The screening test was conducted at a level of 15 db for the frequencies 250, 500, 1000, 2000, 4000, and 8000 cps. The threshold rechecks were made at those frequencies which fell within the speech range, i.e., 500 to 4000 cps. If the screening test indicated a loss of hearing at 250 and 8000 cps, these frequencies were also checked.[2]

Test Routine. Testing was on a voluntary basis. Those individuals who wished to have their hearing tested were interviewed outside the trailer either by a district health nurse or one of the consultants. The information obtained from the individual was recorded on specially prepared test forms. This form consisted of two parts. One part was retained for the files of the State Health Department, while the other part was detached and mailed to the individual tested. This card gave a summary of the test results. The results of the testing were tabulated by individual for each county and were forwarded to the County Health Commissioner for referral suggestions and followup study.

After the questionnaire was filled out, the individuals entered the trailer.

[1]Marian Ausherman, John Clark, Helen M. Morrison, Robert Mulder, John O'Neill, and Betty S. Steur served as consultants.

[2]Very few losses were found at 250 cps. The number of losses found at 8000 cps. were relatively small and will not be treated in this study.

TABLE 2. Test results by county.

County	*Pass*	*Fail*	*Chi-Square*	*Comparison Chi-Square†*
Ashland	127	142	10.46*	
Clinton	202	96	13.77*	1.54
Delaware	71	35	4.98	
Fairfield	126	104	.47	
Greene	198	94	13.54*	.04
Huron	117	97	.61	
Madison	61	97	22.13*	
Montgomery	106	84	.19	
Muskingum	285	200	.70	
State Fair	410	335	1.09	
	1703	1284		

*Significant at the 1% level of confidence, 1 df.

†Comparison with Foladare results. The theoretical frequencies were determined on the basis of the findings of the 1951 study. A similar procedure was followed in the analyses reported in Tables 3, 4, and 5.

During busy hours, subjects were admitted in groups of 10; otherwise two individuals entered at a time. The screening test was administered at the levels and frequencies previously mentioned. The test results were entered on the test card. In the instance of the group screening tests, subjects would write in the appropriate spaces the number of tones they heard at each of the frequencies tested. In the instance of the individual screening tests, only those frequencies not correctly detected were checked. The test cards were then evaluated by one of the consultants. If the individual passed the test, he was dismissed from the trailer. If he failed the test, he remained in the trailer for a threshold recheck.[2] No other groups or individuals were admitted into the trailer until the threshold measurements were completed. The results of the threshold checks were entered in the appropriate section of the test card.

[2]The criterion for passing was no more than one failure for two ears. If there were two or more failures, the individual was referred for recheck.

Subjects. Two thousand, nine hundred and eighty-seven individuals were tested. Of this group, 1,643 were female and 1,344 were male. The division of this group by county is listed in Table 1.

Results

The information from each of the test cards (personal information and test results) was coded and transferred to IBM cards. Computations, except for final steps, were performed on IBM equipment. The obtained scores were then treated statistically (chi-square) to determine if the observed findings for individual categories deviated from the group, or expected norms. The statistical evaluations and their significance will be reported under six headings. These categories are: (1) counties, (2) sex, (3) age, (4) occupation, (5) diseases, and (6) audiometric findings.

Counties. The results of the testing for each county are summarized in Table 2. Also included are the ob-

TABLE 3. Test results for males and females.

	Number	*Pass*	*Fail*	*Chi-Square*
1952 Study				
Males	1344	702	642	12.51*
Females	1643	1001	642	10.23*
				Comparison
1951 Study				
Males	354	203	151	12.41*
Females	450	322	128	99.96*

*Significant at the 1% level of confidence, 1 df.

tained chi-squares. The theoretical frequencies for this analysis and for the other analyses that follow were computed on the basis of relationship of individual categories to total results for the 10 fairs. The raw scores in all instances are based on the threshold test results. The chi-squares obtained for Ashland, Clinton, Greene, and Madison Counties were statistically significant. In further analyzing these results it appeared that Clinton and Greene Counties had more individuals in the *pass* category than would be expected on the basis of total number of passes. On the other hand, Madison and Ashland Counties had more failures than would be expected. Apparently Ashland and Madison Counties had more individuals with a hearing loss than the other eight counties. This is of interest in that no active hearing conservation program had been in operation in Ashland County prior to the 1952 survey. However, Madison County and the other counties either had such a program or had a previous hearing survey.

Since Greene and Clinton Counties were involved in the 1951 testing, it was possible to make a comparison between the two sets of results. As can be seen from Table 2, the comparison chi-squares were not statistically significant. Thus it would appear that the results for the two periods of testing are fairly similar.

Sex. Apparently more males failed the threshold tests than did females. The statistical analysis further indicates that the female population had more *passes* than would be expected (Table 3). These results for females are essentially in agreement with those of Foladare who found that the female population of the 1951 survey had more *passes* than the group pattern would indicate, while males had more *failures*. However, statistical comparisons between the two studies indicate that the number of females failing during the 1952 survey was greater than could be expected on the basis of the number who failed in the earlier study. Further discussion of differences between the male and female test results will appear in the section devoted to audiometric findings.

Age. Nine age groups were formed. Seven of the groups covered a 10 year age range. The lowest age group covered the range from six to nine years while the upper group included all individuals 80 years or older. Table

TABLE 4. Test results grouped on the basis of age.

Age Group	*Number*	*Pass*	*Fail*	*Chi-Square*	*Comparison Chi-Square*
6–9	223	189	34	68.79*	10.63*
10–19	943	788	155	270.19*	4.02†
20–29	294	204	90	19.08*	1.01
30–39	398	235	163	.74	5.83‡
40–49	410	188	222	20.42*	.12
50–59	393	114	279	127.60*	11.24*
60–69	218	28	190	173.66*	18.11*
70–79	97	0	97	**	—
Over 80	11	0	11	**	—

*Significant at 1% level of confidence, 1 df.
†Significant at 5% level of confidence, 1 df.
‡Significant at 2% level of confidence, 1 df.
**Absence of obtained frequencies for one cell prevents analysis.

4 lists the number of individuals in each age group as well as the results of the statistical analyses. It is apparent that all age groups, with the exception of the 30-39 year group, differed significantly from the expected result. The younger group (those below 30) had more *passes*, while the groups 40 years and above had more *failures* than the pooled group results would indicate. Apparently, the majority of failures occurred in the instance of individuals 40 years or older.

In the surveys conducted by Webster and others (*4*) and Steinberg and others (*3*), the 20-29 year group was the mean age group in terms of hearing loss, whereas in this study it would appear that the 30-39 year group was the mean group. When the present results were compared with those of the Foladare group (Table 4), it was found that her survey results indicated fewer *failures* in the 6-9 and 70 plus group, and more *passes* for the other groups than in the 1952 survey. Foladare's mean group was the 40-49 group. These differences in mean groups are, in all probability, due to

TABLE 5. Hearing test results and occupation.

Occupation	*Number*	*Pass*	*Fail*	*Chi-Square*	*Comparison Chi-Square*
Clerical	177	106	71	.51	.73
Professional	182	87	95	6.95*	15.57*
Farming	177	49	128	63.16*	.68
Industrial	251	72	179	83.91*	64.76*
Housewife	781	375	406	27.72*	46.65*
Student	1046	876	170	298.39*	1.28
Business	194	68	126	39.15*	—
Others	40	1	39	‡	—
	2848†	1634	1214		

*Significant at the 1% level of confidence, 1 df.
†139 subjects were not included because of insufficient information.
‡Obtained frequency for one cell is too small to permit analysis.

TABLE 6. Hearing test results and diseases.

Disease	*Number*	*Pass*	*Fail*	*Chi-Square*
Measles	2564	1312	1252	.54
Chicken pox	1277	738	539	252.2*
Whooping cough	1063	443	620	158.2*
Mumps	1539	764	775	70.4*
Scarlet fever	387	174	213	26.2*
Diphtheria	161	27	134	112.6*
Other childhood diseases†	519	177	342	139.2*

*Significant at the 1% level of confidence, 1 df.

†Included are such diseases as pneumonia, typhoid fever, rheumatic fever, rubella, and influenza.

differences in the age sampling in the various surveys.

Occupation. The results for the *farming* and *industrial* groups indicate that individuals from these two groups give more indications of hearing loss than any of the other occupations (see Table 5). An interesting finding is the large number of failures for the *housewife* group. This finding is difficult to explain, except in terms of age; otherwise, no other plausible explanation is possible. The smallest number of *failures* occurred in the instance of the *student* group. This group included grade school, high school, and college students. These findings are not in agreement with those of the 1951 survey which indicated a smaller number of *failures* in the instance of the professional, industrial, and housewife groups. However, both studies indicate that the *farming* category contains a significant number of instances of hearing loss.

The other two surveys, San Francisco-New York World's Fair and San Diego Fair, did not directly concern themselves with the hearing loss pattern associated with various occupations. Webster and others (*4*) found some relationship between hearing loss and previous exposure to a noise environment.

Diseases. In order to ascertain if there was a significant disease history associated with hearing loss, an analysis was made of the diseases reported by individuals who had a hearing loss. Seven disease categories were evaluated. From the results of the

TABLE 7. Hearing losses and instances of infections, head injuries, and familial history.

	Number	*Pass*	*Fail*	*Chi-Square*
Head injuries	135	61	74	8.10*
Tonsil-adenoid difficulty	894	487	407	3.35
Ear infections	352	172	180	10.82*
Loss in family	785	329	456	89.10*

*Significant at the 1% level of confidence, 1 df.

statistical analysis (Table 6) it appears that a past history of measles and chicken pox did not occur in association with hearing loss as frequently as expected; whereas a history of whooping cough, mumps, scarlet fever, diphtheria, and other childhood diseases occurred more frequently than group norms would indicate. This does not necessarily mean that these diseases could have been the cause of the hearing loss.

Four other categories associated with hearing loss are listed in Table 7. It can be seen that there were fewer reported instances of a past history of tonsil-adenoid difficulty than the group average would indicate. There were, however, more cases of hearing loss in the other three categories (head injuries, ear infections, and history of hearing loss in family) than the group norms would indicate. The comparison chi-squares indicate that the findings of the present study differed significantly from those of the Foladare (*1*) study in respect to ear infections. The difference was in the direction of a greater number of occurrences of ear infection in conjunction with hearing loss.

Audiometric Findings. When the results of the screening and threshold tests are compared, it is interesting to note that the screening tests were quite accurate. Of the 1,284 individuals who failed the screening test, only 44 passed on the threshold recheck. This means that the screening test was 96 per cent accurate. This figure far exceeds any previously reported figures on the accuracy of screening tests. It should be kept in mind that the majority of the data concerned with the accuracy of screening tests deals with the results of school testing. Also, since testing was on a voluntary basis, it may be assumed that a high percentage of those who requested hearing tests either knew that they had a hearing loss, or suspected that they had some difficulty with their hearing.

The audiometric results were further analyzed in terms of hearing loss for individual frequencies. Only four frequencies, 500, 1000, 2000, and 4000 cps were checked during threshold testing. The degree of loss was grouped into six categories with a range of 10 db per category for five of the categories. Only those losses greater than 15 db were considered.

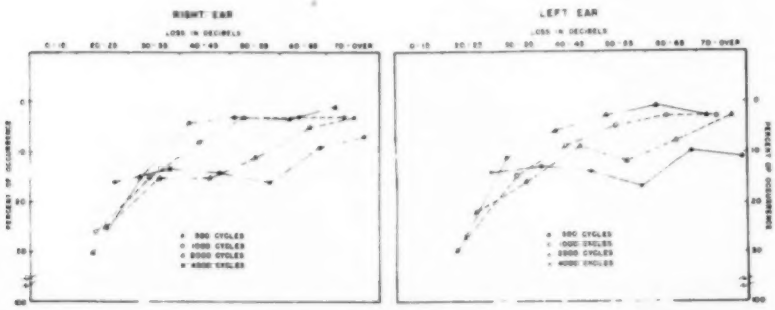

FIGURE 1. Hearing loss, by ear, in terms of degree of loss per frequency (both sexes pooled).

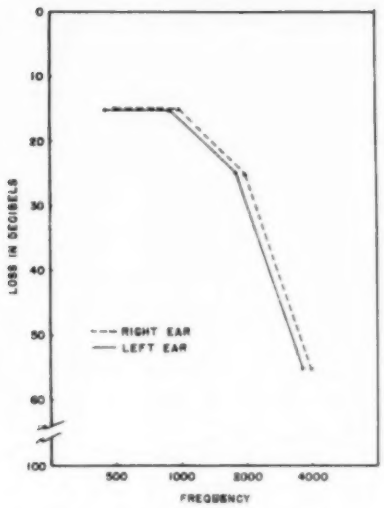

FIGURE 2. Composite audiogram (both sexes pooled). Threshold points represent *most* severe loss for the particular frequencies.

The results were further analyzed in terms of right or left ear and sex.

Figure 1 portrays the loss by *ear*. It is apparent that the greatest number of losses occurred in the 20-25 and 30-35 db range. The frequency that was most affected was 4000 cps. Also it is evident that the results were fairly similar for both ears. If a composite audiogram is plotted in terms of greatest loss for each ear, this similarity between ears becomes evident (Figure 2). These results are similar to those of Steinberg (*3*) and others who found no appreciable difference between ears in terms of hearing loss.

When the hearing loss pattern is analyzed in terms of sex, a loss in the range from 20-25 db is the most frequent hearing loss pattern for the hard of hearing male and 4000 cps was the frequency most affected (Fig-

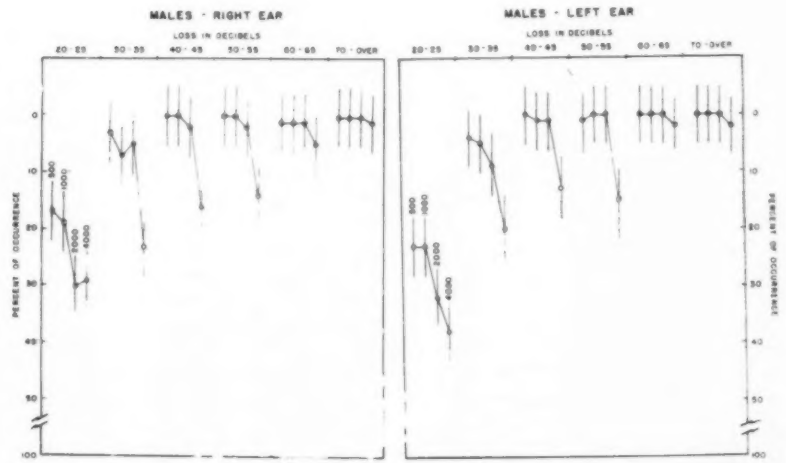

FIGURE 3. Hearing loss for males (right and left ears). Vertical lines represent the four frequencies. *Degree of loss* represents the decibel loss in 5 db categories. *Frequency of occurrence* indicates the degree to which the loss occurred for the particular frequencies and particular loss categories.

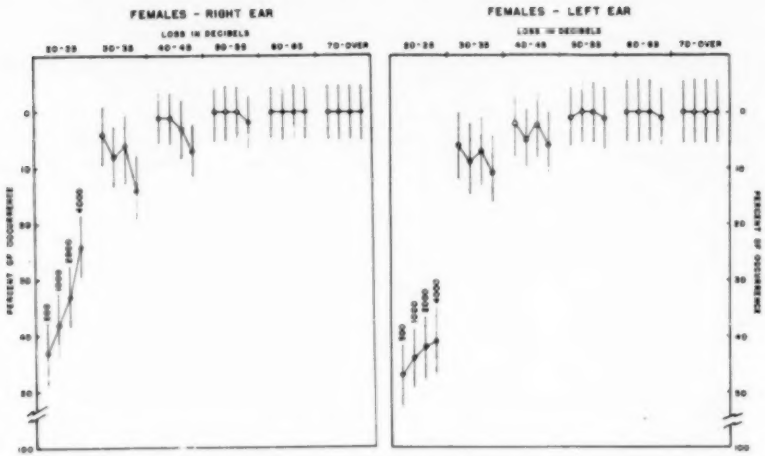

FIGURE 4. Hearing loss for females (right and left ears.). Vertical lines represent the four frequencies. *Degree of loss* represents the decibel loss in 5 db categories. *Frequency of occurrence* indicates the degree to which the loss occurred for the particular frequencies and particular loss categories.

ure 3). The loss pattern for both ears was somewhat similar except in the instance of 4000 cps where the loss was most pronounced in the left ear. In the instance of females, the greatest loss also occurred for the range from 20-25 db; 500 cps appeared to be the frequency most affected with 4000 cps showing the next most pronounced loss (Figure 4). The left ear appeared to be most affected.

The World's Fair surveys found that the majority of losses occurred at 3520 cps. and 7040 cps. The San Diego survey showed similar results in terms of 7040 cps, but did not reveal the loss at 3520 cps. It is not possible to make direct comparisons with these two studies since different frequencies, 440, 880, 1760, 3520, and 7040 cps. were tested. Webster (*4*) and others reported, however, that the males in the San Diego sample had better hearing than the female sample at low frequencies, while the women heard better at high frequencies. These results are somewhat in agreement with those of the present study.

Because of the apparent hearing loss associated with individuals who are engaged in farming and industrial work, an analysis was made of the hearing loss pattern for these two groups. The farming group had the greatest percentage of loss (30-35 db) for 2000 cps. in the right ear. However, both ears showed the greatest overall loss (all loss categories) at 4000 cps. For the industrial workers, the greatest loss was found at 4000 cps (50-55 db) in the right ear. If the loss for both ears is considered, it appears that 4000 cps. is the most susceptible frequency with some involvement for 2000 cps. also. These results agree with the findings of other studies.

Discussion

In light of the results of the study it can be concluded that, with the type of testing routine used and the type of equipment employed, it is possible to conduct a large scale survey of hearing at county fairs. It should be mentioned that there are certain precautions to be considered in the conducting of such a survey. It is imperative that the testing site be located away from busy concessions, loudspeaking systems, noisy exhibits or any other such noise provoking or attention distracting sources.

Several findings of the survey sugguest further study. The first of these is the hearing loss associated with the farming group. The loss pattern (2000 and 4000 cps.) suggest that this loss may be due to something other than advancing age. Secondly, there appeared to be a sufficient number of individuals who worked as glass blowers with a hearing loss to warrant further investigation. This is one occupational group which has not been surveyed in reference to hearing loss or type of noise environment.

Summary

A hearing survey was conducted at Ohio County Fairs.

The major results of this survey can be summarized as follows:

1. A higher percentage of males failed the threshold tests than females. Forty-eight per cent of the males tested and 39 per cent of the females tested failed the threshold tests.

2. Individuals over 40 years old failed the threshold tests more frequently than did individuals 39 years old or younger.

3. A significant number of individuals who listed their occupation as farming or industrial work showed hearing losses.

4. Auditory sensitivity appeared to decline with age, especially after 40 years of age. In the instance of the total hearing loss pattern, the losses for the left and right ears were fairly similar. The frequency most affected was 4000 cps.

5. In the instance of females, the left ear appeared to be less sensitive while for males the loss pattern was fairly similar for both ears. The males apparently had better hearing for lower frequencies while the females had better hearing for the higher frequencies.

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Relationship Between Severity Of Stuttering And Word Conspicuousness

William D. Trotter

It is a well known clinical and experimental (*6*) fact that a stutterer varies considerably in severity from one individual moment of stuttering to another. The question arises as to what are some of the factors that might possibly cause this variation in severity. It seems reasonable to suppose that degree of "conspicuousness" of the words to a stutterer might be related to the degree of anxiety over stuttering on the word and hence to the severity with which he stutters the word. The present experiment was concerned with determining whether there is a functional relationship between the "conspicuousness" of a word and the severity of stuttering on the word.

In the last of a series (*1*, *2*, *3*, *4*, *5*) of experiments concerned with the loci of stuttering in the speech sequence, Brown (*2*) gave each of the words in a reading passage a weight of four, three, two, one or zero, depending on the number of the following characteristics it possessed: (1) the word was a noun, adjective, verb or adverb; (2) the word was one of the first three in a sentence; (3) the word began with some consonant other than [ð], [h], [w], [ʍ] and [t]; (4) the word contained five or more letters. When 31 stutterers read this passage, it was demonstrated that a greater percentage of stuttering occurred on the words in the higher weight categories than on words in the lower weight categories. Brown (*2*) explains this behavior as follows:

> . . . the four linguistic attributes of words herein considered may be interpreted in terms of their contribution to the importance or conspicuousness of the various words in the speech sequence. Clinical observations, experimental studies and introspective reports of stutterers indicate that the frequency of stuttering is in direct proportion to the stutter's desire to avoid it. It seems reasonable to assume that this desire to avoid stuttering is greatest at those points in the speech sequence which the stutterer feels are most conspicuous or important. Hence, the present study may be taken as a statistical definition of the four characteristics which stutterers evaluate—though doubtless seldom on a conscious level—as being important in determining the degree of conspicuousness of the words they are speaking.

'Conspicuousness' of a word in this experiment was defined in terms of Brown's criteria. If Brown's hypothesis is true, it would be expected that not only would the words in the higher weight categories be stuttered more frequently but also that they would be stuttered more severely than

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the words in the lower weight categories. The present experiment, therefore, was concerned specifically with determining whether there is a functional relationship between the weight of words according to Brown's criteria and the severity of stuttering on the word.

Procedure

Trotter (*6*) recorded 20 stutterers reading a 500-word passage five times in succession. The 100 recordings were randomized. The recordings were played back twice to two judges working independently, who marked on copies of the passage what they believed to be the moments of stuttering. Any word that was marked at least twice out of a possible four times was regarded as a stuttered word. The recordings were played back to a group of observers consisting of 11 speech pathology students enrolled in a course in stuttering therapy and theory. They judged the severity of each individual moment of stuttering through an application of the method of equal-appearing intervals employing a nine-point scale extending from one for least severe stuttering to nine for most severe stuttering. From the judgments of the raters, a mean severity rating was calculated for each of the stuttered words. The mean severity ratings of the stuttered words in the first reading provided the basic data for the present study. The stuttered words of the first reading were categorized, according to Brown's (*2*) criteria, as words of weights zero through four. The analysis was confined to the words stuttered on the first reading, since there is no apparent basis for hypothesizing that the results from this one reading would be different from the results which would be obtained from a similar analysis of any other reading. It was necessary to omit the data for one of the 20 stutterers from this analysis because he did not stutter on any zero-weight words.

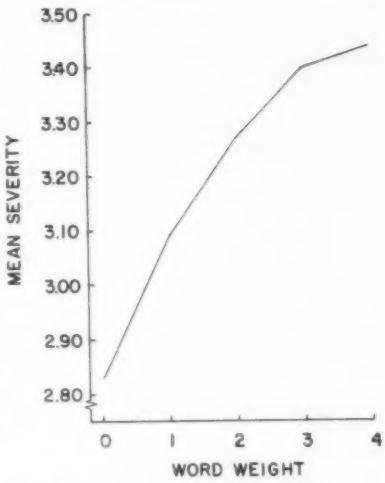

FIGURE 1. Mean severity of stuttering on words classified according to Brown's word weights.

Results

The mean severities for the zero-weight, one-weight, two-weight, three-weight, and four-weight words are 2.83, 3.09, 3.27, 3.40, and 3.44, respectively. Each of these five means was arrived at by calculating, for each stutterer separately, the mean severity ratings of the stuttered words of a particular word weight category and then averaging these 19 means. Figure 1 is a graphic representation of the mean severity of stuttering on the words in the five categories. The

TABLE 1. Analysis of variance for testing the differences among the mean severity ratings of the five word-weight categories.

Source of Variation	*df*	*ss*	*ms*	*F*
Word weight (W)	4	4.81	1.20	8.00*
Subjects (S)	18	19.31	1.07	
W x S	72	10.49	.15	
Total	94	34.61		

*$F = ms_W/ms_{W \times S}$; $F_{.05}$ (df = 4 and 72) = 2.50.

curve indicates a progressive increase in the mean severity of stuttering from weight one words to weight four words with no reversals in the direction of this trend. Table 1 is the analysis of variance summary table. The value of *F* is significant at the five per cent level. There are significant differences[1] between (1) the mean of the zero-weight category and the mean of the one-, two-, three- and four-weight categories and (2) the mean of the one-weight category and the means of the three- and four-weight categories. The results indicate a functional relationship between word-weight and the severity of stuttering on the word. In general, the higher the weight of a word the more severe the stuttering on the word.

Discussion

The present experiment has demonstrated that stuttering on higher-weight words is more severe than on those words in the lower-weight categories. This finding is in agreement with Brown's hypothesis that the higher-weight words are evaluated by the stutterer as being more 'important' or 'conspicuous' than the lower-weight words. Since the stutterer evaluates the higher-weight words as being of greater importance, he probably experiences greater desire to avoid stuttering on them. Consequently, he stutters on them more severely.

[1]Critical difference = $t_{.05}\ (2ms_{cs}/s)^{1/2}$, where ms_{cs} = mean square for conditions x subjects, s = number of subjects, df = (c-1) (s-1), c = number of conditions. The value of the obtained critical difference is .24.

Summary

The purpose of this experiment was to determine whether severity of stuttering on a word is dependent upon the number of certain factors which may be characteristic of a word in the speech sequence: (1) the word is a noun, adjective, verb or adverb; (2) the word is one of the first three in a sentence; (3) the word begins with some consonant other than [ð], [h], [w], [ʌ] or [t] and (4) the word contains five or more letters.

A reading of a 500-word passage by each of 20 stutterers was recorded. Each stuttered word was assigned a weight in accordance with the number of the above-mentioned characteristics it possessed. The severity of stuttering for each stuttered word was evaluated by averaging the responses of 11 observers who rated each stuttered word on a nine-point equal-appearing intervals scale.

Statistical evaluation of the differences among mean severities of the word-weight categories indicated that higher-weight words are stuttered more severely than lower-weight words.

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Parental Environment Of Stuttering Children

A. C. LaFollette

The general purpose of this study was to explore certain aspects of the parental environment of stuttering children. The study investigated certain traits and attitudes of mothers and fathers of stuttering children as measured by a battery of self-administered tests. The test results of parents of stuttering children were compared with those of the parents of non-stuttering children.

Subjects

Several specific objectives were kept in mind in the selection of subjects for this investigation. In the first place, an adequate number of parents of stuttering children was desired for the experimental group. Because a bona fide list of parents of stuttering children was also essential, a reliable diagnosis of each stuttering child was important. Finally, it was desired that this group should consist of a sampling drawn from a wide geographical area.

In order to realize these objectives, speech correctionists throughout the United States holding the rank of Clinical or Professional Member, as listed in the Directory of the *Journal of Speech Disorders* of June, 1947, were asked to secure names and case history data. The speech correctionists were instructed to send the names of stutterers currently enrolled for remedial speech training whose parents they thought would co-operate in a study of the problem of stuttering. Eighty-five families, representing 25 states in the United States and two provinces of Canada, returned test data.

The control group consisted of parents from 50 homes whose children neither stuttered nor had any other significant speech defects. They were obtained in a manner similar to that used in selecting the experimental group. The number participating in each group varied from test to test because of illness or failure on the part of a participant to complete the test satisfactorily, rendering it invalid.

Tests

The tests used in this research, all self-administering, were sent by mail to each participant. Full instructions accompanied each test.

Information was obtained about the subjects' self-adjustment and social adjustment by mean of the two halves of the California Test of Personality (*9*). Children are usually believed to fare best when surrounded by the companionship and directing influence of parents with stable, well-balanced personalities. It was considered important to know to what extent stuttering children have had such an environment.

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Subjects' ascendant-submissive tendencies were measured by the Allport Ascendance-Submission Reaction Study (*1*). It was not the object of this study to show that either ascendance or submission is intrinsically more desirable than the other. However, it appeared necessary to discover not only who is the dominant parent in the stutterers' home, but what are the attitudes, traits and tendencies of this dominant member.

Scores were also obtained on the Psycho-Somatic Inventory of McFarland and Seitz (*6*). This test of general 'mental health' served as a useful adjunct to the two tests already mentioned.

A measure of degree of intolerance for stuttering was secured by means of the Ammons-Johnson Test of Attitude Toward Stuttering (*2*). Ammons and Johnson make clear the great importance of both the stutterer's attitude and that of his associates toward stuttering. Van Riper (*10*) showed experimentally that penalties placed on stuttering tend to increase the incidence and severity of stuttering. Johnson (*3, 4*) associates the reaction of parents to stuttering with both the onset and the perseverance of stuttering. Without attempting to verify or deny these theories, it was considered essential that an inventory of parental attitudes toward stuttering be made in connection with this study.

A Test of Parental Attitude Toward the Roles of Boys and Girls. In addition to the above four tests, an instrument was devised for the purpose of measuring certain differences in parental attitudes, standards, and expectations for boys and girls. Schuell (*8*), through her extensive study of mortality rate among children, childhood diseases, physical development, language development, mental growth, school adjustment and behavior problems, found the male child to be the weaker of the two sexes. The male, hypothetically, encounters more unequal competition, and consequently more frustrations. Schuell pointed out that his language develops more slowly than that of the female, and that he develops socially and physically at a slower rate than the female. Furthermore, Musselman (7) found that high school teachers discriminated against boys in personality and character trait ratings. In view of this evidence, there seemed to be a need to determine whether or not parents tend to hold double standards for boys and girls which might tend to make adjustment easier for one and more difficult for the other. Such a condition might conceivably be favorable to the onset or development of stuttering in certain children.

The Ammons-Johnson test was used as a pattern. Items were constructed in accordance with the criteria set forth by Wang (*11*) and Likert (*5*). The reaction scale ranges from relative acceptance to relative non-acceptance and employs the same score values used by Ammons and Johnson. Scoring is done on the basis of the subject's choice of one of five alternative responses listed after each item: strongly agree, moderately agree, undecided, moderately disagree, and strongly disagree. Using Likert's method of assigning arbitrary scores to the five possible responses, it was decided to have the scores arranged in descending numerical value: 5, 4, 3, 2, 1. Using this order, the higher the score the greater the bias in the male-female situation, and the greater the degree of intolerance where the item relates to stuttering. It was further decided that in order to avoid confusion over the 'undecided' scores a

value of '0' should be assigned, so that the score values become: 4, 3, 0, 2, 1. The test is scored by calculating the mean of the scale values selected by the subject in response to the entire series of items. As a result, scores for the test will fall somewhere between 1 and 4.

The test was constructed of the following statements or propositions:

1. Boys should be prepared to face extremely severe competition in our system of individual enterprise.

2. Girls should expect a less difficult time getting adjusted to our system of individual enterprise than boys.

3. Parents should maintain rigid, high standards for boys in order to teach them to be rugged and resourceful.

4. Other things being equal, one should expect girls to be naturally more resourceful, exact, and thorough than boys.

5. Parents should not be surprised to find that it requires more pressure to obtain desired results from boys than from girls.

6. Parents should be more stern with boys than with girls in dealing with the problem of stuttering. (This statement approaches the same problem as in number 5, but from a different direction. The proposition is intended to show whether or not parents have a tendency to apply more pressure indiscriminately on boys than on girls.)

7. Parents should not expect to find boy stutterers as concerned about their speech defect as girl stutterers.

8. Parents should not expect to find boys as careful about their personal habits as girls.

9. Parents should be more concerned about correcting the speech habits of boys than of girls.

10. In any situation, parents should take more care to protect a girl's feelings than they would when dealing with a boy in like circumstances.

11. Parents should use more tact and gentleness in dealing with girls and their problems in general than when dealing with boys and their problems.

12. Girls should have more social grace than boys, so it should be considered worse for a girl to stutter than for a boy to stutter.

13. Girls should normally have less difficulty in getting over stuttering than boys.

14. Parents should be more concerned if they have a girl that stutters than if they have a boy that stutters.

15. Girls should be more careful about their personal habits than boys.

16. Since men are usually the 'bread winners' in American families, and since expression through speech is important to success, parents should be more concerned over a stuttering boy than over a stuttering girl.

Results

A significant difference was found between the mean of the experimental group and that of the control group on the Ascendance-Submission test. This difference indicates that the experimental group showed a greater tendency toward submission than did the control group. Significant differences were not in evidence on the other tests when the experimental and control groups were considered as a whole.

A significant difference was found in Ascendance-Submission scores between fathers and mothers of the stuttering children, indicating that the fathers of the stutterers showed

TABLE 1. A comparison of the test scores: (A) Fathers of the control group and fathers of the experimental group, (B) Fathers of 3 to 18-year-old stutterers and fathers of 19 to 30-year-old stutterers, and (C) Fathers of 30-year-old stutterers and fathers of the control group.

Test	*Mean 1*	*Mean 2*	*Diff. of Means*	*Stand. Dev. Group 1*	*Stand. Dev. Group 2*	*Stand. Error Mean 1*	*Stand. Error Mean 2*	*Stnad. Error of Diff. of Means*	*Critical Ratio*	*Degrees of Freedom*	*Level of Significance*
A. Fathers of control group (Mean 1) and fathers of experimental group (Mean 2)											
California—Part I	67.02	63.41	3.61	12.69	11.91	2.01	1.58	2.56	1.41	97	NS
California—Part II	65.60	61.59	4.01	10.77	9.96	1.70	1.32	2.15	1.87	97	NS
Ascendance–submission	-5.80	-12.20	6.40	12.50	18.55	1.93	2.37	3.06	2.09	103	.05
Psycho–somatic	125.70	87.00	38.70	84.90	94.70	13.10	12.43	18.06	2.14	100	.05
Attitude toward stuttering	80.81	78.97	1.84	27.81	25.97	4.29	3.17	5.33	0.35	109	NS
Attitude toward roles	33.36	33.52	0.16	7.35	6.10	1.13	0.74	1.35	0.12	109	NS
B. Fathers of subjects 3-18 (Mean 1) and fathers of subjects 19-30 (Mean 2)											
California—Part I	66.62	58.49	8.13	9.69	13.26	1.66	2.83	3.28	2.48	56	.02
California—Part II	64.47	57.17	7.30	9.72	8.25	1.67	1.76	2.42	3.02	56	.01
Ascendance–submission	-8.15	-22.55	14.40	17.40	17.20	2.98	3.37	4.50	3.20	60	.01
Psycho–somatic	86.60	96.40	9.80	69.70	106.73	11.96	22.24	25.25	0.39	57	NS
Attitude toward stuttering	68.32	92.48	24.16	20.93	26.18	3.35	5.03	6.04	4.00	66	.001
Attitude toward roles	32.60	34.42	1.82	6.02	6.22	0.96	1.20	1.54	1.18	66	NS
C. Fathers of subjects 19-30 (Mean 1) and fathers of control group (Mean 2)											
California—Part I	58.49	67.02	8.53	13.26	12.69	2.83	2.01	3.47	2.46	62	.02
California—Part II	57.17	65.60	8.43	8.25	10.77	1.76	1.70	2.45	3.44	62	.001
Ascendance–submission	-22.55	-5.80	16.75	17.20	12.50	3.37	1.93	3.88	4.32	68	.001
Psycho–somatic	96.40	125.70	29.30	106.73	84.90	22.24	13.10	25.81	1.14	65	NS
Attitude toward stuttering	92.48	80.81	11.67	26.18	27.81	5.03	4.29	6.61	1.77	69	NS
Attitude toward roles	34.42	33.36	1.06	6.22	7.35	1.20	1.13	1.65	0.64	69	NS

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greater submissive tendencies than did the mothers of stuttering children. The other test scores, when compared in this manner, showed no substantial difference.

A comparison of the fathers of the experimental group and the fathers of the control group on the Ascendance-Submission test revealed that the fathers of the experimental group were more submissive than the fathers of the control group. This difference, as shown in Table 1(A)[1] was found to be significant at the 5 per cent level of confidence, and appears to account for the greater submissive tendencies of the experimental group. The fathers of stutterers were also more variable than those of the control group on this test. The difference in standard deviations was significant at the 1 per cent level, *t* being 2.79.

Table 1(A) shows an even greater difference between the two groups of fathers on the Psycho-Somatic test. The fathers of the control group have a mean of 125.7, while the mean of the fathers of the experimental group is 87.0. This difference is significant at the 5 per cent level. It is concluded with a reasonable degree of confidence that the fathers of the experimental group as a whole seemed less well adjusted, in terms of mental health, than did the fathers of the control group. Statistically significant differences between the two groups were not observed on the other tests.

A comparison of the mothers of the stutterers with the mothers of the non-stutterers tended to show no dependable difference between the means or the standard deviations of the two groups on any tests. In attempting to interpret these findings, it should be pointed out that many of the mothers of the experimental group may have had the advantage of varying degrees of parent education on the subject of stuttering. Numerous references were made by these mothers, on the case history form accompanying the tests, to conferences with speech correction teachers and to frequent visits to the speech clinic. It will be remembered that, in order to insure bona fide stutterers, only families who had stuttering children enrolled in college or university clinics for speech training were accepted in the experimental group. Thus, the influence of the clinic instruction on the parent accompanying the child to the clinic was unavoidable. This fact was made clear by mothers who enclosed such notes with their completed test papers as, 'Had I answered these questions before taking our child to the speech clinic my answers would have been quite different.'

A comparison of the fathers of stutterers from 3 to 18 years of age with the fathers of stutterers from 19 to 30 years yielded a number of significant differences as shown in Table 1(B). The father of the older stutterers tended to show less favorable self-adjustment on the California Test of Personality. The same group showed greater submissive tendencies on the Ascendance-Submission test. On the Test of Attitude Toward Stuttering, the fathers of the older stutterers showed less tolerance for stuttering than did the fathers of the younger stutterers.

Table 1(C) shows that the father of the 19 to 30-year-old stutterers had significantly poorer social and self-adjustment and were more submissive than the fathers of the control group.

[1]The complete set of data on which the tables are based is on file in the library of the University of Denver.

This was not found to be true of the fathers of the younger stutterers.

No dependable differences were obtained in comparing parents of male stutterers with parents of female stutterers, whether as groups or as subgroups.

Summary

In an attempt to explore certain aspects of the parental environment of stuttering children, a battery of tests was self-administered to the parent or parents of 85 stutterers, constituting the experimental group, and the same tests were administered to the parents in 50 homes, constituting the control group, where no significant speech defects were exhibited by the children. It was discovered that the parents of the experimental group showed a greater tendency toward submissiveness than did the parents of the control group, and that the fathers of the experimental group showed a greater tendency toward submissiveness than did the mothers. When the fathers of the experimental group were compared with the fathers of the control group, they showed greater submissive tendencies and less satisfactory mental health.

When the experimental group of fathers was broken down into subgroups according to the age ranges of their stuttering children, the fathers of the 19 to 30-year-old group showed a significant difference when compared with every other group which was studied. By and large, the fathers of the older stuttering group showed less satisfactory personal adjustment, greater tendencies toward submissiveness, and greater reactions against stuttering.

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On Predicting The Intelligibility Of Speech From Acoustical Measures

Karl D. Kryter

Although the measurement of the intelligibility of speech transmitted over a communication system has become a well accepted, and to a large degree standardized procedure, it is a complicated and time consuming business. For example, intelligibility testing usually requires the training of a crew of talkers and listeners for several weeks before reliable measures can be obtained. The training and final testing is done with standardized tests of words or sentences, and the performance, or intelligibility test score, of the system under examination is expressed as the percentage of words or sentences correctly heard. In addition to these steps, noise and other acoustical conditions must be simulated under laboratory conditions in order to provide the proper acoustic environment.

To side-step these rather laborious psycho-acoustic methods, attempts have been made to devise procedures for calculating from purely physical measurements what the intelligibility of speech ought to be over any particular communication system. It is argued that on the basis of our previous knowledge of how fundamental acoustical variables affect speech and hearing we should be able to deduce or 'predict' intelligibility test scores for any given speech communication system from the acoustical characteristics of the speech signal and the noise reaching the listener's ears.

These techniques for predicting the intelligibility of speech, insofar as they are valid, represent a very great contribution by laboratory research to the art of designing communication systems. It is the purpose of this paper to review briefly some of the methods used for predicting speech intelligibility test scores.

The Twenty Band Methods. The major effort to date in the research and development of methods for estimating the effectiveness of speech communication on the basis of acoustical measures has been that of the Bell Telephone Laboratories (BTL). That effort, which involved many important studies conducted over a number of years, resulted in two published methods for predicting speech communication; one by French and Steinberg (*5*) in 1952, and one in 1953 by Fletcher and Galt (*4*).[1]

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[1] In 1939, Pocock published in Great Britain a method for calculating speech intelligibility that is somewhat similar to those developed at BTL. He divided the speech spectrum into a number of bands each 200 cps wide and calculated the importance value of each band to speech intelligibility.

However, the procedures had been used for a number of years previously by BTL and were made available prior to that time in BTL publications. Both the Fletcher and Galt and the French and Steinberg procedures are based on measurers of the sound pressure in each of twenty 'equal articulation' bands which encompass frequencies of sound from about 200 to 6100 cps. To evaluate a given communication system, the ratio of speech intensity-to-speech threshold in the quiet in each of the twenty bands is determined and given a value of 0 to 1, depending on the magnitude of the ratio. The resultant values are averaged over the twenty bands to give what is called an 'Articulation Index' or AI. Functions showing the relationship between AI and various measures of speech articulation (perception of individual speech sounds) and intelligibility (the perception of words, phrases or sentences) have been developed (see Figure 1). However, these relationships are not well established for all types of speech intelligibility tests.

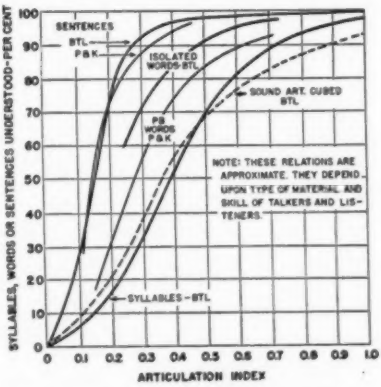

FIGURE 1. Relation between AI and various speech sounds, words, and sentence test scores. The curves marked 'BTL' are taken from French and Steinberg (*5*); those marked 'P & K' represent data obtained by Pickett and Kryter (*8*).

It is not necessary to make acoustical analyses of the speech signal transmitted over the system to be evaluated in order to determine the signal level in each of the twenty bands; the authors of the methods propose, rather, that an idealized spectrum of speech, which has been published by French and Steinberg, (*5*) be adjusted by the frequency response characteristics of the system under study. Thus, the primary physical measurement required is the overall frequency response of the system.

The originators and users of this method were much interested in the effects upon speech intelligibility of filtering and other types of frequency distortion of the speech signal; the method permits the accurate estimation of the effects of frequency distortion upon speech communication, as has been shown by French and Steinberg, (*5*), Fletcher and Galt (*4*), and Beranek (*1*).

The success of the BTL method in estimating the effects of frequency distortion led to the attempt to predict the effects of noise on speech communications by the same general methods. Instead of obtaining the signal-to-speech threshold ratios in each of the twenty equal articulation bands, the signal-to-noise ratios are measured and an AI is determined in a manner somewhat similar to that used for the quiet conditions. Thus, in addition to the frequency response of the system under study, a spectral analysis of the noise reaching the listener's ears is required when the effectiveness of a communication system for use in noise is to be evaluated.

It was proposed that, within certain limits, the masking of a band of speech by a band of noise would have a comparable effect on speech intelligibility as the suppression of the same band of speech by band-pass filtering. It is to be noted that in the evaluation of a communication system, the combined effects of variations in frequency response among the twenty bands, as well as noise masking in each band, are presumably taken into account by these procedures.

Beranek (*1*) developed the work sheet shown in Figure 2 for use with the BTL twenty-band method when applied to speech communication in noise. Data taken from the work sheet are treated as follows: (a) the speech peaks-to-noise ratio in db in each of the twenty-bands is divided by 30 db, (b) the resulting fractions are summed, and (c) the total is divided by twenty. The value obtained in step (c) is the AI for the particular system being evaluated.

It is to be noted that 12 db is added to the true root-mean-square (rms) pressure of speech when the speech spectrum is plotted on the work-sheet. This follows from the fact that the speech wave contains peak pressures that contribute to speech intelligibility which exceed the long-term rms pressure of speech by about 12 db. Also, with normal speech for an average talker using constant conversational vocal effort, the peak pressures of individual speech sounds cover a range of about 42 db from the weakest to the most intense. On theoretical grounds, then, we would expect that the strongest speech peaks must exceed the masking noise by 42 db if the weakest speech sounds are to be detected above the noise. Taking certain auditory factors into account

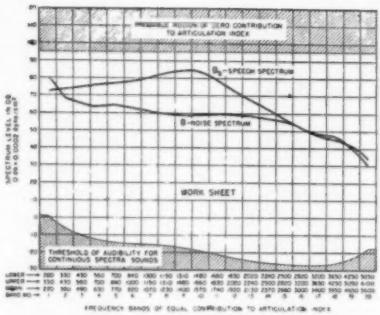

FIGURE 2. Work sheet for use with BTL twenty band method. From Beranek (*1*).

French and Steinberg concluded that with a speech peak-to-noise ratio of 36 db all the speech sounds would be detectable and should accordingly be afforded an AI of 1.0. Later, emperical tests by Beranek and others indicated that a speech peak-to-noise ratio of 30 db provided perfect speech reception or an AI of 1.0. Accordingly, and in each of the twenty-bands, a speech peak-to-noise ratio of 0 db or less is given an AI of 0 and a speech peak-to-noise ratio of 30 db or greater is given an AI of 1.0. Ratios in between these extremes are weighted proportionately.

The articles of French and Steinberg (*5*) and Fletcher and Galt (*4*) describe many refinements, qualifications and limitations that apply to what can be called the BTL twenty-band method of measuring speech communications. It was hopefully felt by research workers and engineers in the field of communications that here was a method which accurately handled in a fairly general fashion the two most basic variables affecting a speech communication system, frequency distortion and noise-masking.

The method proved successful in many situations, particularly those in-

TABLE 1. Speech interference levels (in decibels re 0.0002 microbar) which barely permit reliable conversation at the distances and voice levels indicated (Beranek octave-band method).

Distance in feet	*Voice Level*			
	Normal	*Raised*	*Very Loud*	*Shouting*
0.5	71	77	83	89
1	65	71	77	83
2	59	65	71	77
3	55	61	67	73
4	53	59	65	71
5	51	57	63	69
6	49	55	61	67
12	43	49	55	61

volving frequency distortion; but, as will be indicated more fully later, some difficulties were experienced in applying it to certain types of noise. Also, the procedures have not been as commonly used as might be expected because of the relative complexity of computations involved, and, most important, because of the requirement that spectral analysis of the speech and noise be made in terms of the twenty articulation bands. The filters required for such analyses are available at only a few laboratories.

The Octave Band Methods. Since the octave band analyses are most readily accomplished by most laboratories, Beranek (*2*) and Strasberg (*10*) proposed methods for estimating maximum tolerable noise levels for satisfactory speech intelligibility in in which acoustical measures of the noise are made by octave bands. The Beranek octave band procedure is as follows: the arithmetic average of the db level of the noise in each of the octave bands, 600-1200 cps, 1200-2400 cps, and 2400-4800 cps is found; a table (see Table 1) is then consulted which shows what the computed noise level can be for various voice levels at various distances between talker and listener for a PB (Phonetically Balanced word tests) word intelligibility of 84% correct. As the voice level is increased and distance from source to listener is decreased, the maximum tolerable noise level of course becomes greater. The table prepared by Beranek is based on his computations which show that the arithmetic average of the octave band levels of noise in db will permit a PB word intelligibility score of 84% when the voice is 10 db below an overall level of undistorted speech measured over a long period of time. Speech communications that give a PB word intelligibility score of 84% would be near 100% for sentences or connected discourse. In the judgment of most engineers, such a system would be regarded as highly satisfactory for most purposes.

TABLE 2. Maximum permissible speech interference levels. (Strasberg octave-band method).

Distance to talker in feet	*Acoustic absorption of space in sabines*	*Voice Level*			
		Shout	*Very loud*	*Raised voice*	*Normal*
½	Any value	90	84	78	72
1	Any value	84	78	72	66
2	Any value	78	72	66	60
4	Below 100	78	72	66	60
	Above 100	72	66	60	54
8 or more	Below 100	78	72	66	60
	100–400	72	66	60	54
	400–1600	66	60	54	48

The Strasberg (*10*) technique is essentially the same as Beranek's, except that the arithmetic average in db for 4 octave bands of noise (300 to 4800 cps) is used. Also, Strasberg proposes a slightly higher criterion, 92% PB word intelligibility (see Table 2). Attention is invited to the fact that both Beranek and Strasberg give tables showing noise criteria for different levels of vocal effort. This implies a situation involving person-to-person speech and an ability of the talker to maintain various levels. We shall see later that both of these implications are probably not justified.

There are other factors besides frequency distortion and noise interference, such as reverberation, nonlinear masking, amplitude distortion, *etc.*, which will affect speech intelligibility. French and Steinberg (*5*) and Fletcher and Galt (*4*) have techniques for including some of these other variables in their computational methods. Beranek (*3*) proposed a definite set of values for different amounts of reverberation to take into account the generally degrading affect of reverberation upon speech intelligibility. Although Strasberg includes some allowance for reverberation (or its lack) in his procedures, the shorter octave band methods were put forth to take into account only the effect of noise on undistorted speech.

How much generality can we achieve, at the present state of the art, in a method for computing speech intelligibility from acoustical measurements? An attempt will be made to answer these questions by briefly examining the performance of the BTL and octave-band methods, as applied to conditions of frequency distortion, masking due to noise, and person-to-person speech.

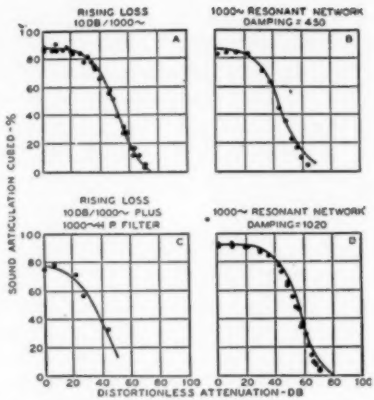

FIGURE 3. Comparison of observed articulation test results (dots) and results (solid lines) computed according to the French and Steinberg formulation of BTL twenty-band method. French and Steinberg (*5*).

Frequency Distortion. Can effects of frequency distortion (as present in a radio-telephone, telephone, interphone or public address system) upon speech intelligibility be predicted by the twenty band and octave band methods? The twenty band BTL method works well for evaluating effects of frequency distortion upon speech intelligibility with the following reservations: (a) the talkers and listeners must be in the quiet or a 'flat' noise spectrum, (b) the talkers must use a conversational or normal vocal effort (see Figure 3). The octave band methods of Beranek and Strasberg do not attempt to handle the effects of frequency distortion.

Masking by Noise. Can the masking effects of continuous spectrum noises upon the intelligibility of speech presented by earphones or a loudspeaker be predicted by the twenty band and octave band methods? Data from Beranek (*1*) and Pickett and Kryter (*8*) demonstrate that

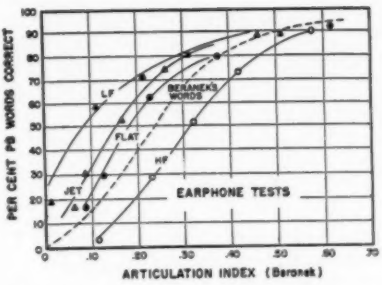

FIGURE 4. PB word intelligibility in predominantly low frequency noise (LF), jet aircraft noise, flat noise, and predominantly high frequency noise (HF). From Pickett and Kryter (*8*).

the twenty band method does not satisfactorily predict speech intelligibility in noises other than those with a relatively flat spectrum. The masking effects of noises with predominantly low frequencies upon PB word and sentence intelligibility tend to be over-estimated and the masking effects of noises with predominantly high frequencies tend to be underestimated by the twenty-band method (see Figure 4).

The octave-band method proposed by Strasberg (*10*) does not predict the masking effects of other than flat noise, over-estimating the masking effects of low frequency noises, and under-estimating the masking effects of high frequency noises (see Table 3). In one experiment (Pickett and Kryter), the octave band method of Beranek predicted fairly well the effect on speech intelligibility of (a) a flat noise, (b) a noise with a slope of + 6 db per octave, and (c) a noise with a −6 db slope per octave (see Table 4). However, the Beranek octave band method takes into account only noise in the 600-4800 cps band and assumes, as does the Strasberg method, undistorted speech over a wide range (200-6100 cps). The Beranek octave band method, although it performs satisfactorily in some cases, must surely lack generality since it omits from consideration noise above 4800 cps and below 600 cps. Beranek makes the point that in every day life wide band spectral noises seldom if ever contain more energy in the octaves below 600 cps and above 4800 cps than they do in the region between 600 to 4800 cps. However, the frequencies above 4800 cps and below 600 cps include, according to BTL data, about 25% of the audible frequencies important to speech intelligibility. For this reason frequency distortion of the speech signal in those frequencies would not be prop-

TABLE 3. Effects of noise spectrum on Strasberg octave-band predictions of speech level required for criterion intelligibility (adjusted to predict with flat noise).

Test	*Required speech level relative to predicted in db*		
	LF Noise	*Jet Noise*	*HF Noise*
PB—words (Earphones)	−6	−5	+6
PB—words (Loudspeakers)	−5	−4	+11
Harvard sentences (Earphones)	−4	+1	+3

TABLE 4. Effects of noise spectrum on Beranek octave-band predictions of speech level required for criterion intelligibility. (adjusted to predict with flat noise).

Test	*Required Speech level relative to predicted in db*		
	LF Noise	*Jet Noise*	*HF Noise*
PB—words (Earphones)	−1	−1	+3
PB—words (Loudspeakers)	0	0	+9
Harvard sentences (Earphones)	+2	+3	+1

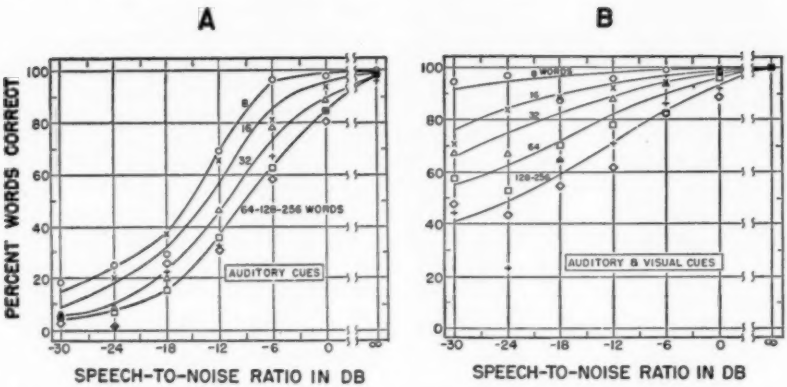

FIGURE 5. Compare A with B to show contribution of visual cues (lip reading) spondee word intelligibility. For a given series of tests the word lists were limited to a restricted set of words; the number of words in the various sets is indicated on the parameter. From Sumby and Pollack (*11*).

erly evaluated by the octave band methods.

In applying the octave-band methods to the prediction of speech transmitted over a communications system, it must be assumed that the talkers use normal vocal effort and that frequency-wise the speech signal is undistorted. These limitations also reduce the flexibility of the octave-band method.

Person-to-Person Speech. Can person-to-person speeech communications be predicted by the twenty-band or octave-band methods? French and Steinberg, Fletcher and Galt, and Beranek in their articles on the BTL method did not suggest that the method be applied to the prediction of the intelligibility of person-to-person speech communication, although methodologically such could be done. The octave-band methods as proposed by Strasberg and Beranek, on the other hand, appear to be dedicated to the prediction of person-to-person speech, although it is possible to consider speech via a communication system by following certain steps that were implied but not stated by Beranek and Strasberg.

There is reason to believe, however, that the prediction of person-to-person speech by any of the methods proposed to date is not possible and attempts to do so are unwarranted. For example, Sumby and Pollack (*11*) found that speech intelligibility was greatly increased in noise when the listeners could observe the talker's lips and facial movements (see Figure 5). This factor has not been sufficiently quantified to be used when predicting speech intelligibility.

Other factors which make prediction of the intelligibility of person-to-person speech impractical is the lack of adequate data concerning the voice level talkers will use in various levels of noise and the effect of vocal effort upon speech intelligibility. With respect to the first consideration Kryter (*6*) found that as the noise level is increased, the talker does

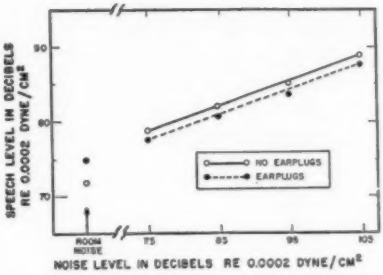

FIGURE 6. Effect of noise level on speech intensity. Solid dots are for talkers wearing V-51R earplugs; open circles are for the same talkers not wearing earplugs. From Kryter (*6*).

not raise his voice level to compensate adequately for increases in noise level (see Figure 6). In this experiment the talkers were instructed to make themselves heard as clearly as possible by a group of listeners who were seated 7 feet away with their backs to the talker. There was only a 10 db rise in voice level (77 to 87 db) over a 30 db increase in noise (75 to 105 db). It would appear that we cannot assume that a talker will or can compensate by vocal effort for changes in noise level, even at moderate levels, as is required by Beranek and Strasberg in their octave-band method.

With respect to the effect of vocal effort, Pickett and Kryter (*8*) have found that when signal-to-noise ratio is kept constant, speech intelligibility decreases when vocal effort falls below a certain level (a speech intensity of about 50 db one meter from the talker) or exceeds a certain level (a speech intensity of about 79 db at one meter from the talker). For example, when employing either a heavy or maximum shouting effort, speech intelligibility declines below the level predicted by Strasberg and Beranek in their tables showing maximum tolerable noise levels as a function of voice level (see Figure 7).

Discussion and Conclusions

The twenty-band method of BTL as depicted by French and Steinberg and Beranek handles frequency distortion very well, but apparently not noise masking; the octave-band method does not take frequency distortion into account, but the Beranek octave-band method does fairly well in predicting intelligibility of undistorted speech via earphones or a loudspeaker in noises of various spectra.

Clearly more work must be done before a method can be agreed upon that will take into account both frequency distortion effects and the masking effects of noise. The considerations that detract from deriving differential weights for the twenty bands proposed in the BTL method for the prediction of the masking effects of noise of various spectra are practical ones: (a) the relative complexity of computations in applying

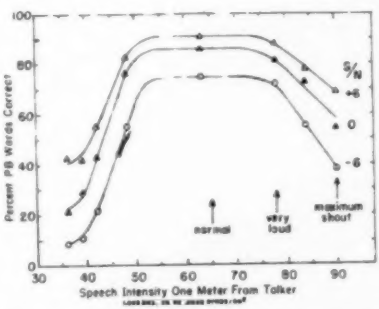

FIGURE 7. Effect of vocal effort on speech intelligibility. Word tests were recorded at a constant level with talkers using various degrees of effort and played back to listeners at several signal-to-noise ratios. From Pickett and Kryter (*8*).

the twenty-band method, and (b) the difficulties in obtaining twenty-band spectral analyses of the speech and noise.

A practical solution for use with an electro-acoustical system would be to apply to the idealized speech spectrum the fineness of detail available from pure-tone calibrations of the various components of a system. The resulting spectrum, after adding the 12 db peak factor for speech, could be plotted directly on a graph divided into the twenty equal articulation bands. Interfering ambient noise could be analyzed by octave bands and the results converted into appropriate values for each of the twenty equal articulation bands, on the assumption that the noise has relatively continuous and regular slopes in its spectrum. Such an assumption would usually be acceptable. The noise transmitted over the speech system due to pick-up at the microphone would be determined from consideration of the characteristics of the system and would be added to the ambient noise reaching the listener's ears.

It is usually the speech signal which suffers from sharp frequency distortion, whereas the noise is often broad band and regular in spectral shape. Thus a compromise of converting speech from a per cycle basis to a broader twenty equal articulation band spectrum and of converting the noise from an octave-band basis to the narrower twenty equal articulation band spectrum might be effective and reasonable. Nomographs or other aids could be erected to simplify computations.

This procedure of arriving at speech and noise spectra for the twenty equal articulation bands would overcome some practical problems in making acoustical measures of the noise. It is believed, however, that further information is necessary as to the way in which noises of various spectra mask speech, before a general method for predicting speech intelligibility under a wide variety of noise conditions can be finalized.

In the case of direct person-to-person speeech communications in the presence of noise, there are fundamental questions regarding the effects of vocal effort and lip reading which must be answered before we can realistically attempt to predict speech intelligibility on the basis of acoustical measurements or estimations.

In addition to all the problems besetting attempts to predict speech intelligibility under widely different conditions, there are the recent findings of Miller and Nicely (7) that speech articulation consists of four or five independent acoustical factors which are differently related to frequency and noise masking. These facts undoubtedly are the cause of some of the unexpected results in attempting to predict both the effects of frequency distortion and noise masking by dividing, as do the twenty-band and octave-band methods, the frequency scale into a fixed number of bands of fixed width and location on the frequency scale.

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Analog Studies Of The Nasalization Of Vowels

Arthur S. House

Kenneth N. Stevens

In a recent discussion of phonology, Hockett (*14*) introduces the topic of nasalization by saying, 'The acoustic correlates of nasalization are not so clear.' A review of the literature dealing with nasalization and nasality seems to bear out Hockett's contention. The literature is sparse enough for Moser, Dreher and Adler (*18*) to review in a few short paragraphs. They conclude that there is general agreement that 'extra resonances' are added to the vowel spectrum when nasality is perceived but the location of the additional resonances is undecided, and that some disagreement exists regarding the effect of nasality on the overall level of the signal.

From the point of view of articulation, the picture is a little clearer but is not unequivocal. Many students of speech production agree that the articulatory feature most characteristic of nasality involves the coupling of the nasopharynx to the vocal tract proper by appropriate manipulations of the velopharyngeal musculature. This explanation has been discussed in some detail by McDonald and Baker (*17*) who do not fail to indicate various alternative mechanisms. They conclude that 'nasality must be regarded as a "matter of resonance."' They also offer an hypothesis that correlates the perceptual event of nasality with a 'characteristic balance or ratio between oral and nasal resonance,' a ratio that in turn depends upon the relationship between the sizes of the posterior openings into the nasal passages and the oral cavity.

The present paper describes an attempt to learn something about the phenomenon of nasality on three levels of discourse—acoustical, articulatory, and perceptual. In brief, it was assumed that nasality in speech sounds is produced most characteristically by coupling the nose and the nasopharynx to the vocal tract. We designed an electrical analog of the nasal structures, combined this analog with an electrical analog of the vocal tract already available, and observed the activities of these systems.

Electrical Analogs

The Acoustic Tube Model. In order to evaluate the acoustic performance of the human vocal mechanism during the production of vowel sounds, it is convenient to view the vocal tract as an acoustic tube of variable cross-sectional dimensions. The relevancy of this idealization has been discussed at length by Chiba and Kajiyama (*3*), and more recently by Dunn (*9*), Fant

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(*11*), and Stevens, Kasowski and Fant (*25*). In effect, the idealized vocal tube extends from the glottis to the lips and is characterized by cross-sectional dimensions that are small compared with a wavelength. This assumption is valid in the frequency range below about 4000 cps, and it implies that only plane waves are propagated in the vocal tract.

Figure 1 shows a non-uniform tube whose shape was established by the rules described by Stevens and House (*24*). Their scheme establishes idealized vowel articulation in a vocal tract of approximate length 17 cm by specifying three numbers: the effective radius r_o of the tube at the point of greatest constriction in the vocal tract proper (when the portion near the glottis is excluded); the distance d_o of that point from the glottis; and the ratio of the area A of the mouth opening to the length ℓ of the mouth opening. For an average male, the vocal tract proper is assumed to consist of the first 14.5 cm of length from the glottis, and the mouth opening is the (variable) portion of the tract that is more than 14.5 cm from the glottis. The effective radii r at all points along the vocal tract proper (except near the glottis) are given by the equation

$$r - r_o = 0.025\ (1.2 - r_o)\ x^2$$

where x is measured horizontally from the point of constriction. The equation represents a parabola with the apex at the point of constriction and seems to provide an approximate fit to data obtained from direct measurements of x-ray pictures of the vocal tract during vowel production.

The articulatory configuration shown in Figure 1 was established by the values, $d_o = 12.0$ cm, $r_o = 0.4$ cm, and $A/\ell = 5.0$ cm, and can be described as an articulation appropriate to an unrounded front vowel (*24*). When this configuration was set up on an electrical analog of the vocal tract (to be described later) and the tract was excited appropriately, the acoustic end-product was characterized by a first formant at about 300 cps, a second formant at about 2300 cps, and a third formant at about 3000 cps. Furthermore, when this output was given appropriate secondary characteristics (rise and decay characteristics, duration, and inflection), listeners identified the sound with a probability close to unity as the vowel /i/ (*15*). Articulatory configurations that generated other vowels were produced when the parameters d_o, r_o, and A/ℓ were manipulated appropriately.

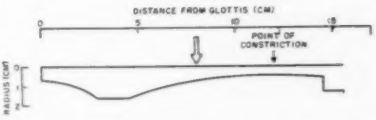

FIGURE 1. Schematization of an idealized vocal tract configuration for vowel production. The three-number code of Stevens and House (*24*) specifies the effective radius of the tube as a function of distance from the glottis. The open arrow indicates the point at which the nasal tract analog is coupled to the vocal tract proper.

The Vocal Tract Analog. The electrical analog of the vocal tract (VTA) used in the present experiments has been described in detail by Stevens, Kasowski, and Fant (*25*). The VTA is an electrical analog of an acoustic tube of variable cross-sectional dimensions. The analogs of acoustic volume velocity and sound pressure are electric current and voltage respectively. The analog of an acoustic tube is an electrical transmission line, which can be approximated by a number of sec-

tions consisting of lumped inductance and capacitance elements. The VTA consists of 35 cascaded sections, each of which represents one-half cm of the vocal tract. In each section, the inductance and capacitance elements are variable and can be adjusted to simulate a wide range of cross-sectional areas. Idealized articulatory configurations described by the three parameters of Stevens and House (*24*) can be set up on the VTA. When the line is excited by an impulsive current source similar to the glottal tone, vowel-like acoustic outputs are obtained, and these outputs are readily identifiable by listeners (*15*) as discussed previously.

The Nasal Tract Analog. The electrical analog of the nasal tract is similar to the VTA. In Figure 2 the gross geometry of the analog is shown in terms of equivalent cylindrical sections. The dimensions are based largely upon measurements obtained from anatomical atlases, sample skulls, and lateral x-ray pictures, and represent approximations that probably are reasonable.[1] The dimensions of some portions of the nasal tract exhibit wide variations from individual to individual. These dimensions may also vary with time for a given individual. The data in Figure 2 are intended to represent approximate median values for a normal male subject. A portion of the nasal tract is divided into two channels, but within the frequency range of interest the utilization of a single tube to analog such a structure is a valid procedure if the two parallel channels are identical.

The region of the nasopharynx is represented by three variable inductance-capacitance sections of length one-half, two and one cm respectively. When the average cross-sectional area of these variable sections is reduced to zero, the geometry is analogous to velopharyngeal closure in an idealized male subject. Increasing the average cross-sectional area of these sections produces various degrees of patency of the posterior nasal port. The remaining sections in the nasal analog are not variable.

The nasal analog is coupled to the VTA at a point eight cm from the glottis, indicated by the open arrow in Figure 1. The action of the velar structures in the analog is in some respects unlike velar activity in the human talker. In the analogs the dimensions of the vocal tract do not change when the velum is lowered,

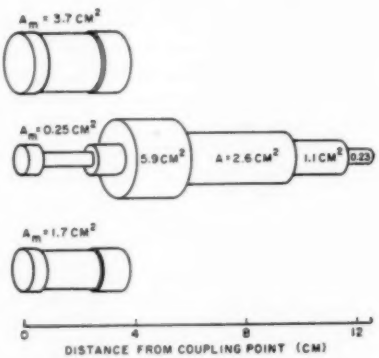

FIGURE 2. Cylindrical sections of equivalent cross-sectional area are used to portray the effective dimensions of the nasal tract analog as a function of distance from coupling point. At the left of the figure are shown configurations that represent three values of average area of coupling, A_m, to the vocal tract, that is, three degrees of patency of the posterior nasal port.

[1] In 1927, when faced by a similar problem of estimation, Crandall (*5*) wrote: 'I know of no determination . . . of the actual volumes of the mouth and pharynx, in any position for a given individual, nor have I succeeded, by consulting anatomical experts, in obtaining the desired data.' This unhappy state of affairs appears still to be with us, especially for the nose.

i.e., when the cross-sectional area of the variable sections of the nose is increased. The effects of moderate changes in the dimensions of the VTA in the vicinity of the velum have been investigated informally, however, and have been found to produce a negligible change in the acoustic spectra of synthetic nasalized vowels.

In addition to the capacitive and inductive elements that serve to establish the dimensions of the sections, the circuitry of the fixed sections includes resistive elements both in parallel with the capacitances and in series with the inductances. The total damping in the human nasal tract is greater than that in the vocal tract because the nasal tract contains constricted passages and has large surface areas of soft tissue as its walls. The amount of damping in the nasal tract varies considerably from one individual to another. In the nasal tract analog used in the present experiments, the series and parallel resistance elements are selected to distribute the damping relatively uniformly through the fixed sections of the analog circuit. The half-power bandwidths of the resonances of the nasal tract analog alone (*i.e.*, uncoupled to the vocal tract analog) vary from about 200 cps for the lowest resonances (at about 400 cps) to approximately 500 cps for resonant frequencies near 3000 cps. These values should be compared with the bandwidths of the resonances of the vocal tract alone, which are of the order of 150 cps or less, since the damping in the vocal tract is smaller than that in the nasal tract.

Physical Studies

Procedures. When human subjects produce voiced sounds, the vocal folds are caused to vibrate, and the vocal tract is excited by a quasi-periodic source with a relatively high acoustical impedance. The waveform of the source has a sawtooth shape, and the amplitudes of the harmonics of the spectrum decrease with increasing frequency at six to 12 db per octave (*25*). To produce synthetic vowel sounds with the VTA, the glottal source was simulated by a periodic sawtooth voltage source connected through a high resistance to the glottal end of the VTA. The output voltage was taken across a small inductance in series with the radiation impedance, and was proportional, therefore, to the derivative of the current through the radiation impedance. Thus, the output voltage was proportional to the sound pressure that would be measured at a distance from the output of the analogous acoustic tube. The output of the nasal analog was obtained in the same manner, and the two outputs were added to obtain the effective radiation from the nose and the mouth in the correct relative proportions. For the perceptual studies of nasality (to be described later), this combined output was recorded on magnetic tape.

To collect physical data descriptive of the spectra of synthetic nasalized vowels, the sawtooth voltage source was replaced by an audio oscillator with constant voltage output. The oscillator output was also passed through a shaping network designed to duplicate the characteristics of the glottal spectrum. The oscillator was swept through all frequencies from 150 to 5000 cps and readings were obtained from a voltmeter connected across the combined mouth-nose output. In effect, this procedure yielded the magnitude of the transfer impedance of the system (ratio of output sound pressure to input volume veloc-

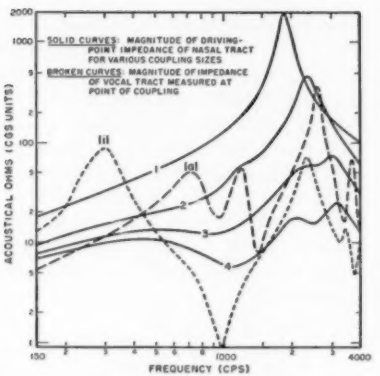

FIGURE 3. Magnitude of acoustical impedance of nasal tract and vocal tract as determined from electrical measurements on the respective analogs at point of coupling. Numbers on solid curves refer to coupling sizes as follows: (1) 0.25 cm^2, (2) 0.71 cm^2, (3) 1.68 cm^2, (4) 3.72 cm^2. Vocal tract configurations are indicated.

ity) taking into account the shape of the glottal spectrum. A plot of the output voltage as a function of frequency gives a curve that is analogous to the spectrum envelope.

In order to examine the interactions between the vocal tract and the nasal tract, two other types of impedance measurements were made. The magnitude of the driving-point impedance of the nasal analog was measured as a function of frequency by driving the analog with a sinusoidal current source and measuring the voltage across its input terminals. This measurement was made for a number of degrees of patency of the nasopharyngeal sections, and represents the magnitude of the impedance of the nose when viewed from the vocal tract. The second impedance measurement was made on the VTA at the velum, that is, at the point where the nasal analog was connected to the VTA. This internal impedance measurement was made for a number of configurations of the VTA, and represents the magnitude of the impedance that is seen looking back into the VTA from the input terminals of the nasal tract, with the glotal source disconnected.

Results and discussion. Impedance Measurements and System Interactions. The curves in Figure 3 show the magnitiude of the driving-point impedance of the nose and the internal impedance of the vocal tract, both plotted as functions of frequency. The solid curves demonstrate that the magnitude of the driving-point impedance of the nasal tract increases as the velum rises, that is, as the average area of the coupling is reduced. The broken curves in Figure 3 represent the magnitude of the internal impedances of the vocal tract when the articulatory configurations are appropriate to the production of the two vowels indicated. When the vocal tract is formed to produce /i/, for example, the internal impedance seen at the velum is characterized by a peak in the vicinity of 300 cps, a drop in magnitude near 1000 cps, and a prominence near 2500 cps. The articulation of /ɑ/, however, produces characteristically different values.

By virtue of its smaller size and greater damping, the nose radiates much less sound energy than the mouth when nasalized vowels are produced. Hence, the principal influence of nasal coupling is to modify the output of the vocal tract proper. Comparison of the driving-point impedance of the nose and the internal impedance of the vocal tract indicates the order of magnitude of the interactions that can be expected. If, for example, the former value is greater than the latter, the effect of the nasal

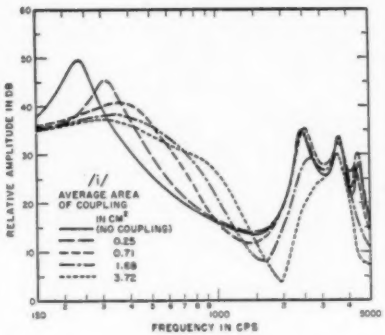

FIGURE 4. Spectrum envelope of combined output of vocal tract and nasal tract for various degrees of coupling, as obtained from measurements on the electrical analogs. Vocal tract configuration is appropriate for the production of vowel /i/.

tract on the combined acoustic output of both systems will be small. If the reverse is true, *i.e.*, if the internal impedance of the vocal tract is greater than the driving-point impedance of the nasal tract, the combined acoustic output will be influenced appreciably by nasal coupling. The principal effect will occur in the frequency ranges where the difference in the impedances is greatest, particularly in the vicinity of the first vowel formant.

When this reasoning is applied to Figure 3, the data suggest that for a given degree of nasal coupling the spectrum of /i/ will be modified more than that of /ɑ/. Similar impedance measurements have been made for other vowel configurations. The data demonstrate an inverse relation between the magnitude of the impedance for the vowel and the height of the vowel in a traditional vowel triangle, *i.e.*, /i/ and /u/ have the highest impedance, /æ/ and /ɑ/ the lowest, with /ɛ/ and /ɔ/ in between.

The assumption that English vowel sounds are produced with a raised velum is generally made in phonetics discussions. This assumption does not preclude the production of satisfactory vowels, but it is probably an exaggeration of the physiological facts. Reports such as those of Harrington (*12*), Bloomer (*2*) and others (*19*, *20*) suggest that systematic differences in the preciseness of closure of the posterior nasal port may exist when human subjects produce various vowel sounds. In general, their data indicate that the velum is raised higher

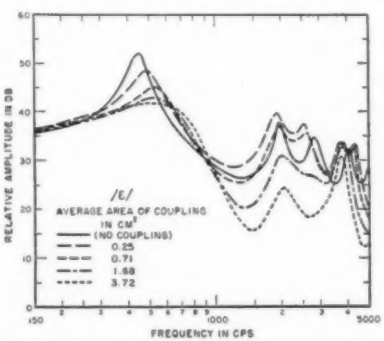

FIGURE 5. Same as Figure 4, except that the vocal tract configuration is appropriate for the production of vowel /ɛ/.

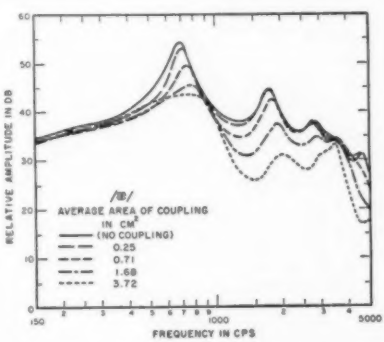

FIGURE 6. Same as Figure 4, except that the vocal tract configuration is appropriate for the production of vowel /æ/.

during the production of an acceptable /i/ and /u/ than during the production of /æ/ and /ɑ/. The data of the present study are compatible with such an interpretation of vowel production but do not support the assumption that a closed velopharyngeal port is necessary for the production of all American English vowels.

Acoustic Spectra. Measurements of the transfer impedance of the combined vocal and nasal systems were obtained for six idealized vowel configurations, each with five degrees of nasal coupling. In Figure 4, for example, are shown five curves that illustrate the effect of nasal coupling on the spectrum of the vowel /i/. The solid curve represents the spectral envelope produced when the appropriate configuration of the VTA alone is excited by a source resembling the glottis. The series of broken curves show the effect on this spectrum when the nasal tract analog is coupled to the VTA. As the coupling is introduced, the first formant drops in amplitude, increases in bandwidth and rises in frequency. Concurrent with these changes there are modifications in the structure of the higher formants, and a spectral prominence appears to be developing in the vicinity of 1000 cps.

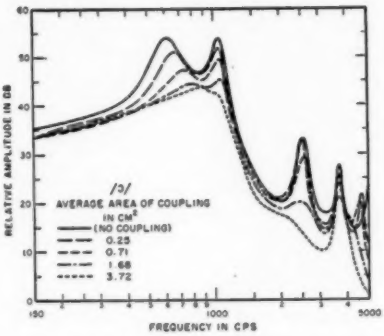

FIGURE 8. Same as Figure 4, except that the vocal tract configuration is appropriate for the production of vowel /ɔ/.

Figures 5-9 present similar data for other common vowels of English and indicate that the effect of coupling the nasal tract to the VTA can be demonstrated for all of these vowels. Some systematic differences from vowel to vowel are discernible, however. A comparison of Figures 4 and 7 shows that the effect of nasal coupling on the vowel /ɑ/ differs in

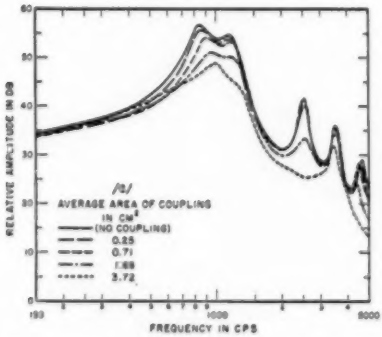

FIGURE 7. Same as Figure 4, except that the vocal tract configuration is appropriate for the production of vowel /ɑ/.

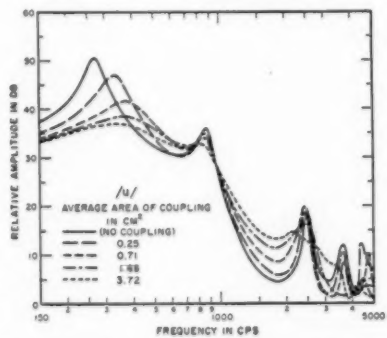

FIGURE 9. Same as Figure 4, except that the vocal tract configuration is appropriate for the production of vowel /u/.

degree from the effect on the vowel /i/. When the nasal coupling during the articulation of /ɑ/ is small, the interaction between the VTA and nasal analog is not great enough to have an appreciable effect on the combined acoustic end-product, while a similar small coupling produces a marked effect on the spectrum of /i/. The degree of change in the spectra shown in Figures 4-9 supports the prediction based on the data of Figure 3.

Figures 4-9 indicate that the general effect of increasing nasal coupling is to broaden and flatten the peaks in the vowel spectra. The most pronounced spectral changes occur in the region of the first formant, and hence it is reasonable to assume that these changes may be of primary importance in the description of nasality. In order to demonstrate the differential effect of vowel articulation, plots of the relative amplitudes of F1 for various amounts of nasal coupling have been made. In Figure 10 the relative amplitudes of the first formants of three vowels are plotted against average area of coupling. The ordinate is the difference, in decibels, between the amplitude of the first formant when the vowel is produced by the VTA alone, *i.e.*, with no coupling to the nasal tract, and the amplitude of the first formant when the vowel is produced with nasal coupling. Curves for the front vowel series /æ ɛ i/ are essentially identical to the corresponding curves for /ɑ ɔ u/ respectively, but are omitted to simplify the figure.

The results of the physical measurements with the analog devices strongly suggest that the first-formant effects may be primary cues for nasality. Delattre (7) has reported experiments that are in agreement with this conclusion, and Smith (*23*) has pointed out that a general reduction in formant height may accompany nasality. We find, however, no other discussions in the literature that specifically identify the perception of nasality with a reduction in the intensity of the first formant, although some experimental data are not entirely incompatible with this opinion. Curtis (*6*), for example, in a study of transitions between vowels and nasal consonants, describes a broadening and a lowering of the first formant during nasalization of the vowel /æ/, although his results for two other vowels cannot be given this interpretation. Other investigators (*13*) have reported shifts in the frequency of the first formant, but in general these shifts are downward, contrary to the present findings.

In addition to the reduction and broadening of the first formant, certain other less systematic and less pronounced changes in vowel spectra have been observed, and it is possible that these effects may also provide some cues for the perception of nasality. For example, Figures 5-9 show that increased nasal coupling results in a reduction of the amplitude of the third vowel resonance[2], and, in the limit, an elimination of this spectral peak. Changes in the amplitude of the second formant may also occur, but these are less systematic than those seen in the third formant.

Other spectral effects are observed if the dimensions or the amount of damping in the nasal tract are modified. It has been noted previously that the dimensions and damping for the nasal tract analog used in most of the experiments are considered to be median values, and considerable varia-

[2]For the vowel /i/ (Figure 4) a similar amplitude reduction occurs in the second formant.

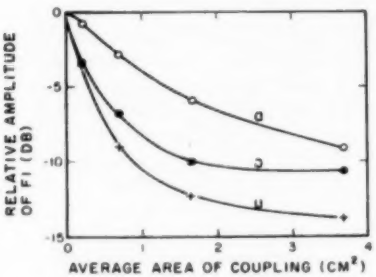

FIGURE 10. Variations in the amplitudes of the first formants of the outputs of three vowel configurations as a function of degree of coupling to the nasal tract analog. Curves are normalized to zero db for zero coupling.

tion about these values may be expected. If the damping in the nasal tract is reduced, for example, an additional peak appears above the first formant of a vowel when the nasal tract is coupled to the vocal tract. Evidence of this peak is seen in Figure 4 near 1000 cps. In addition, a spectral minimum that reflects the presence of an anti-resonance may occur in the frequency range 700-1800 cps, depending on the amount of coupling. A double peak in the region of the third formant is also observed sometimes in cases where the damping in the nasal tract is reduced.

Some of the secondary spectral changes that have been observed in the present experiments have been reported in one form or another in the literature as evidence of nasality. Hockett (*14*), for example, links nasalization to a rise in the third formant of vowels. The present data indicate that during the transition from a nonnasal to a nasalized vowel the third formant deteriorates, and it is possible, therefore, that the spectral prominence being labeled F3 in a nasal vowel is actually the fourth resonance of the vocal tract. In an earlier paper, Delattre (*8*) also correlated the lowering of the velum with a rise in F3, but concluded that the formant shift did not produce perceptual nasality.

Although the speech literature does not present a coherent picture, there is general agreement that so-called 'extra resonances' are introduced into the acoustic spectrum of nasal speech sounds. Smith (*23*), for example, finds additional resonances at 1000 and 2000 cps, Heffner (*13*) refers to additional energy in the regions 400-500 cps and 2169-3096 cps (sic), Joos (*16*) discusses added nasal resonances above F1 and below F2 and F3, and Potter, Kopp and Green (*21*) report that additional resonance bars are visible in spectrograms illustrating positive nasality.

It is clear that more detailed experimental and theoretical studies of these phenomena are needed to resolve some of the uncertainties and contradictions. However, the present data and data reported in the literature suggest strongly that added resonances or peaks in vowel spectra may be secondary cues to nasality.

Overall Intensity. In the preparation of the test items for the perceptual studies described later, it was observed that the overall levels of the various outputs, as measured with a VU meter, varied with different degrees

TABLE 1. Overall levels of vowel-like stimuli. Values are in db relative to standard vowel /i/. The identity of the stimuli when coupling is other than zero cm² is not implied.

Vowel Configuration	*Average Area of Nasal Coupling (cm²)* 0.0	0.25	0.71	1.68	3.72
i	0.0	1.5	-3.0	-4.5	-5.0
ɛ	7.5	6.0	2.0	0.0	-1.0
æ	10.0	9.0	5.5	2.5	1.5
ɑ	8.0	8.5	7.0	5.0	3.0
ɔ	10.0	9.0	7.0	2.5	0.5
u	2.0	3.0	-1.0	-3.5	-5.0

of nasal coupling. In order to record the test items at constant level, it was necessary to adjust the overall gain of the system for each test item. The VU meter readings before such gain adjustments were made indicate how the overall levels of the various synthetic vowels are influenced by nasal coupling. The values of overall levels are given in Table 1. The reference level (zero VU) was established arbitrarily for a standard (uncoupled) vowel /i/.

The tabulated data show that almost without exception the overall level of the acoustic output is reduced when the nasal tract is coupled to the VTA. For any particular vowel configuration, the maximum reduction in overall level ranges from five db to 9.5 db. This finding agrees with the data of Cotton (*4*), and with the more recent statement of Weiss (*26*) that a negative correlation exists between nasality and overall level. It was noted during the recording procedures, however, that perceptible variations in loudness were present even when the overall levels read from a VU meter were held constant.

The data of Table 1 are interesting from another point of view. The overall amplitudes of the signals with coupling held constant vary in a manner compatible with data derived from natural vowels (*1*, *10*, *22*). The intervocalic variation in each column is greater than ranges reported in the speech literature, but slight changes in the articulation of the extreme vowels /i/ and /u/ would make the variation more similar to that reported for natural vowels.

Perceptual Studies

Physical changes in the envelope of the acoustic spectrum of a given vowel do not, of course, constitute direct evidence of nasality. In order to determine the relation of the physical changes to perceptual nasality, the acoustic outputs of various analog configurations have been used as stimuli in two types of listening tests, and responses have been elicited from human subjects.

Absolute Judgments. In one test, the vowel-like stimuli were 600-msec samples of the acoustic output of the vocal tract analog with configurations appropriate to the vowels /i ɛ æ ɑ ɔ u/, plus each of these with four different degrees of coupling to the nasal analog. Identical pairs of stimuli were recorded in quasi-random order, each pair being recorded a total of three times. The number of stimulus pairs in a test was 100, of which only the last 90 were scored. The time between stimuli in a pair was 0.4 second and the time from the end of one pair to the beginning of the next was about four seconds. All samples had the same on-off envelope characteristics, fundamental frequency and rising inflection, and the samples were recorded at a constant level as measured with a standard VU meter.

In the administration of a test, the tape recording was reproduced by a loudspeaker in a lecture room. Standard instructions in written form were given to all subjects, and practice items were provided to acquaint them with the listening task. Twenty-four subjects were undergraduate students of speech at Emerson College and ten subjects were graduate or professional linguists. After each pair was played, the subjects indicated whether the samples were 'characterized by nasality' or whether they were examples of 'non-nasal vowel-like sounds.'

Informal listening, as well as the results of the absolute-judgment test, indicated that the standard non-coupled /æ/ sounded nasal. Although there is no completely satisfactory explanation for this finding at the present time, the band-width of the formants of /æ/ were considerably wider than those of the other sounds. The articulatory configuration used for the vowel /æ/ in the test had a larger mouth opening than the other configurations, a condition which would produce greater damping and hence wider formant bandwidths than those in configurations with smaller mouth openings.

When the vowel /æ/ is removed from consideration, the responses of the 34 listeners indicate that the perception of nasality correlated highly with certain aspects of the physical data. In Figure 11 are plotted data showing, for various vowel articulations, the average area of nasal coupling required to elicit a given level of response indicating nasality. At the 50 per cent level, the responses indicate that a small degree of coupling changes a vowel like /u/ into a nasal sound, while almost three times as much coupling is needed to nasalize /ɑ/.

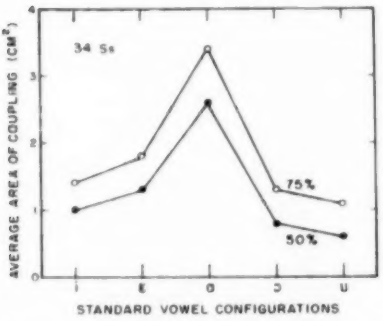

FIGURE 11. Results of absolute-judgment test, omitting /æ/ stimuli. The curves indicate the average area of coupling necessary to elicit 'nasality' responses at two levels.

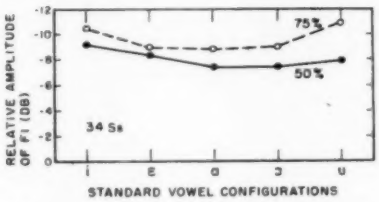

FIGURE 12. The amplitude reductions observed in the first formant of various vowels when 'nasality' is identified at two levels of response.

The trend displayed in Figure 11 is consistent with predictions based on the physical data described previously. Small amounts of nasal coupling produce marked changes in the spectra of the vowels /i u/ that in turn serve as cues for the identification of nasality; a much greater degree of coupling is needed to produce comparable changes in the spectrum of /ɑ/ and thereby to achieve a comparable level of nasality. The data of Figures 10 and 11 can be combined to yield a direct relation between physical changes in the acoustic spectra and the responses of listeners. Figure 12 shows the reduction in the relative amplitude of F1 required to elicit given levels of response indicating nasality. At the 50 per cent level, the required reduction is approximately eight db, and is relatively independent of the vowel.

Paired Comparisons. In addition to the absolute-judgment listening task, the 34 subjects furnished responses to a paired-comparison test. In this test, the stimuli were also arranged in pairs and had the same physical

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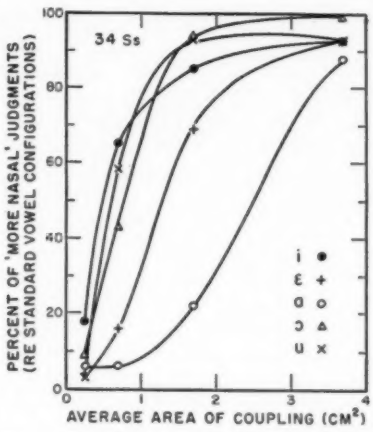

FIGURE 13. Results of paired comparisons between stimuli generated by five standard non-coupled vowel configurations and stimuli generated by the same VTA configurations with various degrees of coupling to the nasal tract analog.

characteristics and spacing as those described previously, (except that stimuli generated by the /æ/—configurations were omitted). The items in each pair were generated with the same VTA configuration but differed in degree of coupling to the nasal tract analog. All items were equated in overall level (VU meter reading), and all pairs occurred in both AB and BA orders. The subjects were instructed to indicate whether the first or the second item in each pair was more nasal, or to indicate that no difference in nasality was detected. Written instructions were used and the listening conditions were identical to those of the other test.

Almost without exception, subjects reported that the relative judgment was easier than the absolute judgment required by the earlier test. The results of the test, however, support the earlier data. In Figure 13, for example, the percentage of 'more nasal' judgment is plotted against the size of the coupling between the systems, with each vowel referred to its own non-coupled standard. The figure demonstrates that as the average area of coupling increases, the 'more nasal' responses to /i/ and /u/ start sooner and increase faster than do such responses to /ɛ/ and /ɔ/, and the nasal

TABLE 2. Results of paired-comparison test of nasality. Values are percentages of responses of 34 subjects. The percentage of responses indicating 'no difference' can be derived from the tabulated data.

'Less Nasal' Responses	*Average Area of Coupling* (cm²)	*'More Nasal' Responses* 0	0.25	0.71	1.68	3.72
		Vowel /i/				
	0	—	18	65	85	93
	0.25	19	—	44	91	100
	0.71	13	4	—	59	91
	1.68	7	4	4	—	43
	3.72	1	0	3	7	—
		Vowel /ɑ/				
	0	—	6	6	22	88
	0.25	6	—	6	21	90
	0.71	12	6	—	19	90
	1.68	4	1	3	—	74
	3.72	1	1	6	3	—

responses to /ɑ/ are the last to be manifested.

The paired-comparison data allow many more comparisons than those afforded by Figure 13. Table 2 presents a description of the responses of the 34 subjects when the basic VTA configurations were /i/ and /ɑ/, two extremes of the vowel continuum. These data bear out the contention that coupling produces more nasality in the case of /i/ than of /ɑ/, and also gives some insight into the 'no-difference' responses. In the case of a large posterior nasal port with an /i/—articulation, for example, 43 per cent of the time the subjects indicated that the stimulus with the largest coupling (3.72 cm^2) was 'more nasal' than the stimulus with the next-largest coupling. This number, 43 per cent, is the smallest number in its column, and indicates that fewer than one-half of the responses selected the stimulus with the larger coupling as the more nasal one. This result should not be interpreted as a reduction in nasality, since further examination of the table reveals that only seven per cent of the responses reversed this decision. That is, 50 per cent of the responses say that there is no difference in the amount of nasality associated with the two stimuli, suggesting that both were heard as nasal sounds. Similar analyses can be made for other pairs of stimuli, and give some indication of the effect of incremental changes in coupling on responses of nasality.

Conclusions

On the basis of the physical and perceptual studies reported, it seems reasonable to conclude that the act of coupling the nasal cavity to the vocal tract during vowel production results in:

(1) a differential reduction in the amplitude of the first formant of various vowels, with a concomitant increase in formant bandwidth and an upward shift in the center frequency of the formant;

(2) a reduction in the overall level of the vowel;

(3) various 'secondary' effects on the spectrum (notably, the introduction of an anti-resonance, the elimination of the third formant and irregularities in upper formants, as well as the possible introduction of additional spectral peaks);

(4) the perception of 'nasality' when the major effects on the spectrum of the acoustic output reach appropriate magnitudes.

The results and conclusions of these studies should not be presented without some qualifying discussion and cautionary remarks. It is recognized that the data under discussion were either derived from or based upon the outputs of electrical analogs of anatomical structures, and were not based directly upon human speech. The limitations of the electrical analog of the vocal tract have been discussed before (*25*) and do not seem to be crucial to this discussion, but the assumed characteristics of the nasal tract, especially with regard to damping, are open to certain criticisms. The limitations in the equipment and techniques are relatively minor, however, and should not obviate the principal conclusions.

Acknowledgments

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Effect Of Voice Quality On Communication

Charles F. Diehl

Eugene T. McDonald

Of the major voice variables (rate, pitch, loudness, inflection, and quality), voice quality has long been regarded by speech specialists as one of the most important for effective oral communication. Other voice variables including syllable duration, intensity, and fundamental frequency have been studied in relation to their effect on intelligibility. The literature relative to voice quality and its effect on communication, however, is limited. Glasgow (*2*) and Moser, Dreher and Adler (*3*), who report that nasality interferes with communication, appear to have made the only related objectives studies to date.

This paper reports the results of an experiment designed to answer two questions: (1) To what extent does the quality of a speaker's voice interfere with his ability to communicate information; and (2) To what extent does a speaker's voice quality affect an audience's rating of his voice.

Procedure

Five voice quality types were selected for study: The four described by Fairbanks (*1*) as voice quality defects—hoarseness, harshness, breathiness, and nasality—and the fifth, a voice free from these characteristics.

Actual clinical types were initially considered for subjects; however, those individuals who appeared to present suitable quality characteristics differed markedly in their use of pitch, rate, inflection, and loudness.

An attempt to control these variables among the subjects proved unsatisfactory; therefore, a trained speaker learned to simulate the four voice quality defects. One-minute recordings of his productions of the five voice quality types were rated by five trained listeners using a rating scale to be described later. The raters were not informed that they were listening to simulations by one speaker. Their ratings demonstrated that the selected voice quality types could be reliably simulated by one speaker.

A 14 minute informative lecture on 'Birds' (a topic about which members of the experimental groups had little knowledge) was prepared and a standardized communication pattern for its delivery was practiced until it was felt that voice quality could be varied and other voice variables held constant. The five samples were recorded by a professional technician who equated the VU-meter deflections during recordings to provide for

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equated playback intensity for all five samples. Two samples of each recording were rated by eight speech specialists for quality, the consistency of the quality, and the remaining voice variables.

The rating scale used consisted of two parts. Part I, concerned only with voice quality, contained five descriptive phrases representing degrees of hoarseness, harshness, breathiness, nasality, and freedom from these qualities. The definition of each voice quality type was based on Fairbanks' (*1*) description. In the scale, each voice quality type appeared separately on a continuum described as representing the particular voice quality in relationship to its use by the average American population. The graduations of the scale ranged from 'freedom from' (Scale:0) to 'large amount of' (Scale:4). Judges were instructed to rate each sample on all five qualities. The judges were not informed that the samples were simulations performed by only one speaker.

Part II of the rating scale was used primarily for measuring speech characteristics in addition to voice quality. These variables included articulation, pronunciation, rate, pitch, inflection, loudness, phrasing, and communicativeness (general use of all Part II variables). With the exception of articulation and pronunciation, which were graduated from 'free from articulation defects' and 'free from errors in pronunciation' (Scale:0) to 'large number of articulation defects' and 'large number of errors in pronunciation' (Scale:4), the graduations of the scale for these factors ranged from 'very good' (Scale:0) to 'very poor' (Scale:4).

Ratings of the five recordings by the eight judges, as analyzed by Thurstone's (*3*) system of scale-value and quartile-distance, indicated the following:

The simulations of hoarseness, harshness, nasality, and breathiness were all given scale-values of 3.0 or higher, indicating that these simulations were valid. The voice free from quality defects was given a scale-value of .13 indicating that this voice was apparently almost entirely free from defective characteristics. All of these traits had quartile-distances of less than 1.0 indicating that the judges were in very good agreement.

All voice types were rated free from errors in articulation and pronunciation. In rate and phrasing, they were rated between 'very good' and 'good'. These variables were, therefore, considered controlled.

For the breathy, harsh, and hoarse voice types, the variables of pitch, inflection, loudness, and communicativeness were considered 'only average'. The nasal voice type was considered 'good' in pitch, inflection and loudness, and 'only average' in communicativeness. The voice free from defects was rated 'very good' in pitch,

TABLE 1. Group C analyzed by halves.

Group	*Number of Listeners*	*Mean Score*	*S.D.*	*Difference*	*t*
C_1	31	26.44	8.79	2.31	1.12
C_2	32	28.75	7.44		

TABLE 2. Groups' response to lecture content and judgment of voice of speaker. S.V. of O = very good; S.V. of 4 = very poor. Q.D. of O = very good agreement among raters; Q.D. of 2 = disagreement amoung raters.

	Part I Group Response to Lecture Content						*Part II Group Judgment of Voice of Speaker*	
Group	*Number of Listeners*	*Voice Type Heard*	*Mean Score (49 = 100%)*	*Group S.D.*	*Mean Difference* †	*t*	*Voice Scale Value*	*Quartile Distance*
A	37	Horse	28.53	7.56	+0.83	.50	3.0	1.2
B	37	Nasal	24.23	8.25	-3.47	1.97*	1.8	1.4
C1		Free from						
C	63	quality	27.70	8.61	——	—	.3	.8
C2		defects						
D	42	Took test only	3.28	2.03	-24.42	21.42*	—	—
E	33	Harsh	28.81	8.04	+1.11	.62	2.1	1.5
F	34	Breathy	21.20	7.14	-7.61	3.92*	2.3	1.5

*Significant at .05 level or beyond.
†Each group compared with Group C.

inflection, loudness, and communicativeness.

Six experimental groups, A, B, C (C1 and C2), D, E, F, (approximate N of 35 for each) to which the final recordings were administered or used otherwise in the experiment, were selected at random from 36 different sections of a college course in public speaking. All group members had at least one year of college work and the majority were third semester students. The various schools in the college population were equally represented in all groups. Because of this random selection and the similar composition of each group, it was assumed that the six groups were matched in learning ability. Group A listened to the hoarse voice, group B the nasal voice, group C the voice free from quality defects, group E the harsh voice, and group F the breathy voice. To provide a basis for estimating the experimental groups' pre-lecture knowledge of the lecture content, group D completed the test on bird information without hearing the lecture.

In order to evaluate objectively the effect of the various voice quality types on the communicativeness of the speaker, a two-part Response Sheet was prepared to be completed by the members of the experimental groups immediately after hearing the recorded lecture. Part I contained a completion-type test of 49 questions based on the lecture content. Part II was a five-point rating scale graduated from 'very good' (Scale:0) to 'very poor' (Scale:4) on which the group members were asked to rate only their reactions to the voice of the speaker.

To check the reliability of Part I of the test, the N of group C, originally enlarged, was separated into group C1 and group C2. In separate testing situations, both groups heard the same voice quality sample and completed the same test. Test reliability was determined by comparing the mean scores for groups C1 and C2 (Table 1). For the comparison of the voice types these data were combined.

All data were collected on the same

day. The same room and playback equipment were used for all groups and the samples were played at the same intensity output level. All groups received the same instructions.

Results

1. A comparison of the mean scores of two experimental groups (C1 and C2), both hearing the same experimental recording, shows that the test was reliable (Table 1).

2. The mean score for group D, which completed the test on bird information without hearing the lecture, was 3.28, suggesting that the population from which the experimental groups was drawn had only slight knowledge of the subject matter (Table 2, Part I).

3. The mean score for the group listening to the harsh voice (group E) was 28.81. The difference between this mean and the control group mean (group C: hearing the voice free from quality defects) was 1.11 in favor of the harsh voice. This difference is not significant.

4. The mean score for the group listening to the hoarse voice (group A) was 28.53. The difference between this mean and the control group mean was 0.83 in favor of the hoarse voice. This difference is not significant.

5. The mean score for the group listening to the nasal voice (group B) was 24.23. The difference between this mean and the control group mean was 3.47 in favor of the voice free from defects. This difference is significant at the .05 level of confidence.

6. The mean score for the group listening to the breathy voice (group F) was 21.20. The difference between this mean and that of the control group was 7.61 in favor of the voice free from defects. This difference is significant at the .001 level of confidence.

7. The voice judged free from quality defects was rated 0.3 (very good); the harsh voice, 2.1 (only average); the hoarse voice, 3.0 (poor); the nasal voice, 1.8 (only average); and the breathy voice 2.3 (only average). All quartile-distances were 1.5 or less indicating fair judge agreement on these ratings (Part II, Table 2).

Conclusions

On the basis of the results obtained from the investigation, although recognizing that the data were obtained only for a sample of college students and on only one speaker simulating quality disorders, the following conclusions and implications are suggested.

1. Simulated breathy and nasal voice quality appear to interfere with a speaker's ability to communicate information. In the case of nasality, the difference, although statistically significant, is only slight.

2. Neither simulated harsh nor hoarse voice quality appear to have any negative effect on the ability of a speaker to communicate information. A reconsideration of the extent to which representative clinical types are handicapping seems indicated.

3. Such a reconsideration, however, should be made in view of the evidence obtained from college students' ratings of the various simulated voice quality types. A voice free from hoarse, harsh, nasal and breathy characteristics they rated 'very good', a hoarse voice 'poor', a harsh voice 'only average', and a nasal voice 'only average.'

4. The relationship between an

audience's judgment of the 'goodness' of a voice and the ability of that voice to communicate information appears to warrant further study.

Summary

A 14-minute lecture was presented to matched groups by means of phonograph recordings. The lecture varied for each of the groups only in five voice quality types (simulated hoarse, harsh, breathy, and nasal quality and freedom from these) produced by one speaker in its delivery. At the conclusion of the lecture, group members completed a response sheet composed of simple recall-type completion questions based on the lecture content, and a rating scale in which the voice of the lecturer was judged. Mean scores for the several groups were compared to determine the effect of voice quality on communicativeness, and the voice ratings were analyzed.

On a pleasantness scale the voice judged to be free from quality defects was rated as very good; the simulated harsh, nasal, and breathy voices were rated as average and the simulated hoarse voice was rated as poor. Only simulated breathy and nasal qualities appear to interfere with communication.

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Status Of Five Front Consonants In The Speech Of Cerebral Palsied Children

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Orvis C. Irwin

This study is concerned with the articulation by cerebral palsy children of five front consonants as elicited by pictorial and verbal stimulations. The five consonants are [p], [b], [m], [d], and [t].

The study was made in an attempt to answer the following questions:

1. Does the kind of stimulation affect the correct consonantal articulation and if so, in what position in the word pattern do the effects occur?

2. Does the order of stimulation affect the mean number of responses?

3. Do differences exist in the articulation of these consonants in the initial, medial, and final positions in words?

4. Are there differences among several schools located in different states?

5. Is there a significant interaction among the factors of stimulation, order of stimulation, position, and schools?

Subjects

Ninety-six cerebral palsied children were studied. They were in residence in the Iowa Hospital School in Iowa City, the Michael Dowling School in Minneapolis, and the Jamestown, North Dakota School. Table 1 indicates the number of male and female subjects in the three schools investigated. One will note that there are 32 subjects in each of the schools with a total of 96, 51 of whom are boys and 45 are girls.

The mean age of the subjects is 8 years and 8 months and the range is 3 years, 7 months to 15 years, 11 months. In terms of the medical diagnoses, the 96 cases included 41 spastics, 41 athetoids, 1 rigidity, 2 flaccids, 6 ataxic, and 5 undetermined. Classified according to extent of involvement, there were 75 quadraplegics, 5 paraplegics, 12 hemiplegics, 1 triplegic, and 3 undetermined. When classified according to degree of involvement, there were 17 mild cases, 35 which were moderate, 40 which were severe cases, and 4 cases which were undetermined.

The results of intelligence tests given to the subjects in the three

TABLE 1. Distribution of male and female subjects in each of three schools.

	Dowling	*Jamestown*	*Iowa*	*Total*
Boys	14	16	21	51
Girls	18	16	11	45
Total	32	32	32	96

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TABLE 2. Mental status of the subjects in each of the three schools.

I. Q. Scores	*Dowling*	*Jamestown*	*Iowa*	*Total*	*%*
40–70	7	5	4	16	19
71–90	9	15	19	43	50
91–110	9	5	4	18	21
111–125	7	2	0	9	10
				86	100
Undetermined	0	5	5	10	
Total				96	

schools are presented in Table 2. The tabulation suggests that 19% of the cases which have been given mental tests are mentally defective, that half of them fall into the borderline classification, that 21% are average, and that 10% are above average. Thus, about 70% are below average. The majority of the subjects were tested with Form L of the Stanford-Binet Scale; a few were given the Wechsler Test for children.

The treatment groups have been drawn at random from the same hypothetical parent population of cerebral palsied children. Because of the distinction between real and hypothetical populations (*2*), any inferences concerning the real population of cerebral palsied children will have to be postponed until a more extensive sampling is obtained.

Procedure

The study is limited to front consonants and includes three labial sounds [p], [b], and [m] and the dentals [t] and [d]. The consonants were presented singly instead of in blends.

Words used in the test were judged by three speech therapists as suitable for research purposes since the words were names of objects, animals, and people with which these children ordinarily were acquainted. The items were arranged in random order and this sequence was followed in administering both the pictorial and the verbal stimulations. Outline pictures were taken from Utley's (*3*) series, a widely used set of pictures. They were selected to illustrate the words. These outlines constitute the picture test and the list of words constitutes the verbal test.

The test consisted of 15 pictures and 15 words. A preliminary word and a preliminary picture in the test were used as trial items. Their purpose was to indicate that the child understood the instructions. The word list is found in the Appendix.

The five consonantal sounds were each tested in the initial, medial, and final positions in the words. An alternate set of items was prepared in case a child failed to perceive an item of the main set.

By means of a table of random numbers, the children in each school were divided into two groups. Both groups received all treatments but the presentation of stimulation was reversed; that is, one group received the picture stimuli first and the verbal stimuli last. The other group received the verbal stimuli first and the pictorial stimuli last. For no child was

there a longer time interval than three days nor a shorter interval than one day which separated the administration of the picture stimuli from the verbal stimuli.

The subject was brought to an isolated room and seated before a microphone and the tape recorder was started. Pertinent information about each child was recorded before the test was given. The examiner's instructions to the subject and the subject's responses to the test items were then recorded on the tape.

The picture test started with the experimenter giving the following instructions: 'I am going to show you some pictures. Will you please give me the name of each picture? Do you understand?' In order to verify if the child understood the nature of the task, a preliminary picture was presented. Before each picture was shown, its number was recorded so that no confusion would arise when the tape was later heard. In no instance during the picture series was a child given a verbal pattern of the word response to imitate.

The same procedure was followed during the administration of the verbal stimulation series except for the fact that the subject was asked to repeat each word in imitation of the experimenter's utterance of the word.

There are five measures which lend themselves to the purpose of analyzing the speech sound status of cerebral palsy children. They are the number of correct articulations, substitutions, omissions, no responses, and neutral responses. In order that the two observers might have a common basis for judging into which category a response should be classified, the meaning of each category was clarified. The following definitions were adopted:

1. A correct consonantal element is one which is in standard position according to *A Pronouncing Dictionary of American English* (*1*).
2. A substituted consonantal element is one which is replaced by another consonant.
3. An omitted consonantal element is one which is not articulated in the correct position in response to the stimulus.
4. No response means that no vocalization has occurred.
5. A neutral response is one which does not resemble the stimulus.

The use of the term neutral as a category needs further explanation. In some instances the child will respond either with an entirely different word than the one requested, or with a meaningless sound pattern. In either case, there is no resemblance to the word stimulus nor are the consonants present. The neutral category is a catch-all category for a response which cannot be classified in one of the other measures.

The present study is limited to an analysis of correct articulations.

Results

In order to study and evaluate the effects of the experimental factors involved in the present study, an analysis of variance of the data was done. The design utilized for this analysis contained four factors. The first two (A and B) were used as Latin square factors, by which the type of stimulation was counterbalanced with the rank order in which the stimulations were presented. The A factor consisted of (P) picture stimulation and (V) verbal stimulation. The B factor

TABLE 3. Summary of analysis of variance for a design consisting of two Latin square factors (A and B), a 'within' factor (C), and a 'between' factor (D).

Source	*df*	*ss*	*ms*	*F*	*p*
Between Subjects	95	1101.66			
D (Schools)	2	191.68	95.84	9.83	.001
AB (b) Group	1	16.00	16.00	1.64	non-sig.
AB (b)D (Group by Schools)	2	16.13	8.07		non-sig.
error (b)	90	877.85	9.75		
Within Subjects	480	686.34			
A (Stimulation)	1	9.50	9.50	10.00	.005
B (Order)	1	.45	.45		non-sig.
C (Position)	2	255.44	127.72	109.16	.001
AC (Stimulation by Position)	2	9.11	4.55	9.48	.001
BC (Order by Position)	2	.15	.075		non-sig.
AD (Stimulation by School)	2	2.64	1.32	1.39	"
BD (Order by School)	2	.64	.32		"
CD (Position by School)	4	7.05	1.76	1.50	"
AB (b)C (Grp. by Position)	2	4.19	2.09	1.79	"
ACD (Stim. by Pos. by Sch.)	4	2.23	.56	1.17	"
BCD (Order by Pos. by Sch.)	4	2.72	.68	1.42	"
AB (b) CD (Grp. by Pos. by Sch.)	4	8.60	2.15	1.84	"
Error (w)	450	383.61			
$error_1(w)$	90	85.77	.95		
$error_2(w)$	180	211.06	1.17		
$error_3(w)$	180	86.78	.48		
Total	575	1788.00			

consisted of (B_1) $Order_1$ and (B_2) $Order_2$. The design also consisted of a 'within' factor (C) for position of the consonant in word patterns. The (C) factor consisted of (I) initial position, (M) medial position, and (F) final position. The fourth experimental factor was a 'between' factor (D) for school where D_1 represents Iowa Hospital School, D_2 Dowling, and D_3 Jamestown School in North Dakota.

It is necessary further to clarify and to precisely define the term order as it will be used in the study. The question here to be investigated is: 'What is the effect of administering the *first* sets of stimuli as against the the *second* sets of stimuli?' *First* refers to the combination of the pictorial set of stimuli administered first to one group with the verbal set administered first to the other group. *Second* means the combination of the second pictorial administration with the second verbal administration. It is in this sense that the term 'order' is used. To repeat, to investigate the main effect of *first* stimuli as against *second* stimuli we paired both *firsts* and also paired both *seconds* presentations of stimulations.

The summary for the analysis of variance is presented in Table 3. From the summary table it will be seen that all higher order interactions are non-significant. All interactions with the 'B' factor (order), 'D' factor, (Schools) and AB (b) groups, are non-significant. The only interaction that is significant is the AC interaction (Stimulation by Position). The main effects of 'A' (Stimulation), 'C' (Position), and 'D' (Schools) are significant. Thus, the null hypothesis of no difference for the pictorial and verbal stimulations, for the initial, medial, and final positions, and for Iowa, Dowling, and Jamestown schools may be rejected.

TABLE 4. Means for the three consonantal positions.

Position	*Total*	*N*	*Mean*
Initial	814	96	8.48
Medial	667	96	6.95
Final	501	96	5.22

TABLE 5. Difference of means of initial and medial, initial and final, and medial and final positions.

	Medial	*Final*
Initial	1.53*	3.26*
Medial		1.73*

*Significant at the 1% level.

Thus, statistical evidence by means of an analysis of variance was found for rejecting the over-all null hypothesis regarding the main effects of position, and schools, and the interaction effects of stimulation by position. The next task was to apply the *t*-test to determine whether the null hypothesis could be rejected for each of the pairs of treatments.

The pairs of treatment for the test for position are: (1) initial and medial, (2) initial and final, and (3) medial and final positions. A further application of the *t*-test was made comparing the pictorial and verbal stimulations in the (1) initial, (2) medial, and (3) final positions. The null hypothesis of no difference concerning three pairs of schools was also tested. The pairs of schools are: (1) Iowa and Dowling, (2) Iowa and Jamestown, and (3) Jamestown and Dowling. In the analysis of schools, positions and stimulations were neglected because schools were not found in the main analysis to interact with the factors.

Table 4 shows the means for the initial, medial, and final positions, and the directions of the differences of means. The significance of the differences of the three pairs of positions was tested. The following formula was used for finding the critical difference:

$$\text{Critical difference} = t\sqrt{\frac{2\text{ms error}_2\text{ (w)}}{s}}$$

where the letter *s* stands for the number of subjects in each treatment group and *t* is the value from the *t*-table significant at the 1% level for 180 degrees of freedom for ms error$_2$ (w). The critical value of *t* at the 1% level for 180 degrees of freedom is 2.58. Substituting the values in the formula a critical difference of .40 is obtained. All of the differences found in Table 5 exceed the value .40 and therefore the null hypothesis of no difference between initial and medial, initial and final, and medial and final positions are rejected. The means for the pictorial and the verbal stimulations in the initial, medial, and final positions are presented on Table 6. The differences of the picture and verbal stimuli in the three positions are

TABLE 6. Means for stimuli in three positions.

	Pictorial			*Verbal*		
	Total	*N*	*Mean*	*Total*	*N*	*Mean*
Initial	398	96	4.14	416	96	4.33
Medial	305	96	3.18	362	96	3.77
Final	251	96	2.61	250	96	2.60

TABLE 7. Difference of means comparing the pictorial and verbal stimulation in the initial, medial, and final positions.

		Pictorial		
		Initial	*Medial*	*Final*
Verbal	Initial	.19		
	Medial		.59*	
	Final			.01

*Significant at the 1% level.

given in Table 7. The same formula for computing the critical difference was used and the value found was .36. It can be seen that the only value in the table of difference of means that exceeded the critical difference of .36 was the difference between the picture and verbal stimulation in the medial position. Thus, the null hypothesis of no difference may be rejected for only one of the three pairs, *i.e.*, the picture and verbal stimulation in the medial position. The differences between the picture and verbal stimulations in the initial and final positions were both non-significant and thus the null hypothesis of no difference was retained for these two pairs.

The means for the three schools are given in Table 8. A tabulation of the differences among these means is presented in the Table 9. A critical difference was computed and found to be 2.01. It will be noted that all the values in Table 9 exceed the critical difference of 2.01. Thus, the null hypothesis may be rejected for all the three pairs of schools: (1) Iowa and Dowling, (2) Iowa and Jamestown, and (3) Jamestown and Dowling. The direction of the differences in pairs of means is indicated in Table 8.

TABLE 8. Means for schools.

	Total	*N*	*Mean*
Iowa	516	32	16.13
Dowling	785	32	24.53
Jamestown	681	32	21.28

Conclusions

1. The pictorial and verbal stimulations have the same effects in the initial and final positions of consonants in word patterns.

2. The verbal stimulation elicits more correct responses in the medial position than does the pictorial stimulation in the same position.

3. Order of the presentation of the stimuli does not affect the number of correct articulations.

4. There are significant differences between the initial and medial positions, initial and final positions, and medial and final positions. Rank order in ease of productions according to position was: initial, medial, and final position.

5. The following pairs of schools differ significantly from one another: Iowa and Dowling, Iowa and Jamestown, and Jamestown and Dowling. Rank order in number of correct sound productions by the schools tested was: (1) Dowling, (2) Jamestown, and (3) Iowa.

6. None of the lower order interactions which involve schools, groups, and order is significant.

7. None of the higher order interactions which involve group, order, and schools is significant.

TABLE 9. Difference of means comparing Iowa and Dowling, Iowa and Jamestown, and Dowling and Jamestown.

	Dowling	*Jamestown*
Iowa	8.40*	5.15*
Dowling		3.25*

*Significant at the 1% level

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Appendix

Items		*Alternates*
1. ball	b-	boy
2. bed	-d	bird
3. rabbit	-b-	baby
4. tub	-b	club
5. cup	-p	soup
6. ice-cream	-m	comb
7. milk	m-	man
8. pig	p-	pie
9. hat	-t	coat
10. mama	-m-	umbrella
11. kitten	-t-	butter
12. dog	d-	duck
13. candy	-d-	candle
14. table	t-	tree
15. apple	-p-	puppy

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Effect Of Phonic Training On Speech Sound Discrimination And Spelling Performance

Empress Young Zedler

If speech correction programs in public schools are to succeed, methods and materials are desirable whereby the classroom teacher and the speech therapist may supplement the work of each other. Such supplementation is especially needed in the teaching of word analysis, a procedure mutual to speech clinic and classroom. The correction of articulatory speech disorders as well as the training of certain language skills, such as spelling and independent word recognition in reading, are primarily based upon the process of word analysis.

It was hypothesized for the purposes of this study that a method of phonic training designed for the dual purpose (a) of focusing auditory attention upon speech sounds and (b) of establishing associations between speech sounds and their corresponding alphabetic symbols should have positive consequences upon the learning of pupils in the primary grades. The investigation of this hypothesis was undertaken in an attempt to find a means of more closely correlating the work of the speech correctionist and that of the primary classroom teacher.

To fulfill the purpose of the study, special materials were designed and entitled the 'Tommy Stories' (*6*). In each of 37 stories, the little boy Tommy learns about a speech sound or a group of closely related speech sounds in the following manner: (a) he identifies the sound with a familiar environmental experience; (b) he discovers the manner and place of producing the sound with his own vocal mechanism; (c) he analyzes the sound out of words within the structure of sentences which he hears; (d) he discovers by listening that the sound may occur in different positions within words; and (e) he associates the sound with its appropriate visual symbol or symbols written for him in upper and lower case manuscript by an adult in his environment. Teaching of the 'Tommy Stories' comprised the method of phonic training used in this study.

Design

Phonic training with the 'Tommy Stories' was evaluated by investigating the effect upon two processes: speech-sound discriminative ability and written spelling performance. Written spelling rather than word recognition was chosen as the lan-

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guage skill to be studied because it was assumed that the influence of training for a special technique of word analysis could be studied more effectively in its relation to spelling. Written spelling is a visual-graphic response to a vocal-auditory stimulus, either immediately present or recalled; the phonic method of word recognition is a vocal-auditory response, either immediately present or recalled, to a visual-graphic stimulus. Since written spelling and the phonic method of word recognition are opposite termini of an associative process which may operate in either direction, it might be expected that training in phonics would influence written spelling performance.

The study was directed primarily toward a test of the hypothesis that this method of phonic training would be followed by (a) improvement in the ability to spell words in writing and (b) improvement in the ability to discriminate between speech sounds. Two main (1 and 2) and two supplementary (3 and 4) questions were asked:

1. Does written spelling performance change significantly with training in phonics?

2. Does speech-sound discriminative ability change significantly with training in phonics?

3. Is there a significant correlation between written spelling performance and speech-sound discriminative ability?

4. Is there a significant correlation between pre-test written spelling performance and gain in spelling performance?

Pupils in the second semester of the second grade were chosen as a suitable population upon which to base the study, since their chronological age norm was approximately eight years. According to Davis (*2*), at this age, other factors being usual, children may be expected to produce all consonant sounds in words. It seemed reasonable, therefore, to expect pupils of this age with no mental or sensory deficiency to be able to learn to discriminate between all the various speech sounds. Also, at the second grade level other variables which might influence spelling ability, such as general or specific school experiences, are at a minimum.

Experimental and control groups were located in five Texas towns affording a varied sampling of school population as to ethnic, occupational, and cultural factors. The experimental and control groups were approximately equal as to number, mean age, sex, mean intelligence and mean social class status (*3*). One hundred and seventeen pupils (65 boys and 52 girls) comprised the experimental group with a mean C. A. of 7 years, 11 months and a mean I. Q. of 100.73. The control group was composed of 115 pupils, (50 boys and 65 girls) with a mean C. A. of 8 years and a mean I. Q. of 102.67. The mean family social-class status of both groups was Upper-Lower (*3*). Only pupils shown to have normal hearing by a pure-tone audiometric sweep check-test at 15 db were included in the study.

There was no attempt to investigate the number of pupils within the sample who had speech defects. It was postulated that auditory word analysis was a necessary procedure in the correction of articulatory speech defects. The burden of proof, therefore, was to show that auditory discrimination of speech sounds would contribute positively also to the learning of another linguistic skill, namely, written spelling.

The general aims of the study were to test the effect of this method of phonic training upon the pupils' abilities (a) to discriminate between the phonetic elements within the unit of a word, and (b) to associate these elements with particular letters of the alphabet. Tests were selected which seemed to be reliable instruments for measuring these abilities. The same tests were administered to the experimental and control groups at the beginning and at the end of the phonic-training period.

The Templin modification of the Travis-Rasmus test of sound discrimination was administered to obtain measures of auditory sensitivity to speech sounds (*4, 5*). The experimental and control groups showed no significant difference[1] in this ability at the beginning of the study. The mean number of erorrs was 23.89 for the experimental group and 24.03 for the control. It was assumed, therefore, that the mean test scores of the two groups on the post-test in sound discrimination would be useful for comparing the two groups.

A spelling test of 40 words was constructed from the Buckingham Extension of the Ayres Spelling Scale (*1*). The words represented an increment of spelling difficulty from the third to the sixth grade levels. In the construction of the spelling test, the fact that English spelling is not entirely phonetic was taken into account. In the list of 40 words, 26 are orthographically phonetic in that each letter in these words corresponds to its usual and particular auditory stimulus. In 14 of the 40 words, the visual and auditory elements do not entirely correspond. It was thought that inclusion of the 14 non-phonetically spelled words contributed to the validity of the spelling test. Reliability of the spelling test was estimated by means of the Spearman-Brown formula employing the split-half method. The obtained coefficient of reliability was .96.

The school experiences of the two groups were as nearly identical as possible, with the exception that phonic training with the 'Tommy Stories' (*6*) was given to the experimental group and withheld from the control group.

All tests and phonic training were given by five speech correctionists who made bi-weekly visits of 30 minutes to the experimental classes over a period of 14 weeks. Within the limits of variation of rapport with and personal consideration of the pupils, procedure in the schools in the five towns was uniform.

The specific aims of the phonic training, as given to the pupils in this study, were (a) to develop awareness of sounds in words to the extent that the pupils could recognize and discriminate the initial, medial, and final sounds by listening for certain sounds in certain places within the word, (b) to associate these sounds with appropriate letter symbols, and (c) to accomplish these aims without losing the unity of the word in meaningful context. The 'Tommy Stories' were designed to fulfill these aims. The stories had the additional characteristics of (a) being adaptable to uniformity of administration by the various experimenters, (b) motivating children to 'listen' for sounds in words, and (c) being highly interesting to children and therefore useful in gaining and holding their attention.

[1] $t = .14/1.75 = .08$; $t_{.05}$ (df = 230) = 1.96. S. D. (experimental group = 12.80; S. D. (control group) = 12.49.

Results

Written Spelling Performance. In scoring the spelling test, a word misspelled constituted an error. The mean numbers of spelling errors for the two groups computed on the pre-test of written spelling ability were 17.97 and 15.10, with the experimental group being the better spellers. The *t*-ratio showed the difference to be significant at the 5% level.[2] It was decided, therefore, to compare actual amounts of gain in spelling made by the two groups.

Following the period of phonic training, gain scores in written spelling performance were computed for all pupils in each group after the post-test in spelling had been administered. The mean reduction in errors was 4.40 for the experimental group and 2.46 for the control group. This difference favored the experimental group beyond the one per cent level of confidence.[3]

Discriminative Ability. To evaluate the influence of the phonic training upon speech-sound discriminative ability, the mean post-test scores were compared. Whereas the two groups were approximately equal in speech-sound discriminative ability at the beginning of the study, the difference in mean scores on the post-test of this factor favored the experimental group beyond the five per cent level of confidence.[4]

Correlation Between Spelling Performance and Discriminative Ability. Since the results support the hypothesis that phonic training improves both written spelling performance and speech-sound discriminative ability, it seemed important to investigate the relationship between these variables. The product-moment correlation method was used in evaluating the relationship between these two factors for both groups of pupils at the beginning and at the termination of the study. Correlation coefficients significant at the one per cent level were obtained for both groups on both the pre- and the post-test scores, as follows: pre-test: experimental group, .31; control group, 53; post-test: experimental group, .44; control group, .51. The evidence thus supports the hypothesis that speech-sound discriminative ability and spelling ability are functionally related.

Gain in Written Spelling Performance. Since less able spellers had more opportunity to improve their scores than did the better spellers, a negative correlation between pre-test scores and gain scores would be expected. Useful educational implications might result from establishing whether those who had had training in phonics showed a higher negative correlation between pre-test scores and gain scores in written spelling than did those who had not received the phonic training.

The obtained correlations between pre-test spelling scores and gain scores were −.37 (significant at the one per cent level) for the experimental group,

[2] $t = 2.87/1.40 = 2.05$; $t_{.05}$ (df = 230) = 1.96. S. D. (experimental group) = 10.80; S. D. (control group) = 11.22.

[3] $t = 1.94/.59 = 3.29$; $t_{.01}$(df = 230) = 2.58. S. D. (experimental group) = 4.60; S. D. (control group) = 4.44.

[4] $t = 3.38/1.58 = 2.14$; $t_{.05}$ (df = 180) = 1.96. S. D. (experimental group) = 10.30; S. D. (control group) = 10.98.

N (experimental group) = 92; N (control group) = 90.

Owing to factors outside the control of the experimenter, one town was omitted on the post-test of speech-sound discriminative ability.

and −.15 (not significant) for the control group. Since the negative relationship between pre-test spelling performance and gain in spelling performance was stronger for the experimental group than for the control group, it might be implied that phonic training is a useful technique for improving the spelling performance of some poor spellers.

Implications

On the basis of the evidence presented in this study, it seems reasonable to draw the following educational implications concerning the importance of phonic training:

1. Since written spelling performance has changed favorably after training in phonics, phonic training might be incorporated profitably into the teaching of the regular spelling lesson.

2. Since there was a significant negative correlation between pre-test and gain scores in written spelling for the experimental group and not for the control group, phonic training may be a particularly suitable tool for use in improving the performance of pupils who spell poorly.

3. Since speech-sound discrimination plays an important part in many aspects of learning, and since the results of this study show that phonic training improves speech-sound discrimination, regular training in phonics probably would influence favorably all aspects of learning in which speech-sound discrimination is included, such as reading readiness, independent word attack, and speech correction.

4. Since written spelling performance and speech-sound discrimination are positively correlated regardless of special training in phonics, pupils probably use speech-sound discrimination to help them learn to spell whether they have been trained to do so or not.

Summary and Conclusions

The purpose of this study was to evaluate the effect upon speech-sound discrimination and written spelling of a method of phonic training which included (a) auditory training and (b) association of speech sounds with alphabetic symbols (*6*). Experimental and control groups were selected among second grade public school pupils in five Texas towns. One hundred and seventeen pupils comprised the experimental group and 115, the control. Tests of speech-sound discrimination and written spelling performance were administered to the two groups before and after the experimental group had received 14 hours of phonic training.

On the basis of experimental results the following conclusions seem warranted:

1. Written spelling performance changes significantly and favorably with this method of training in phonics.

2. Speech-sound discriminative ability increases significantly with the phonic training.

3. Written spelling ability and speech-sound discrimination are significantly related variables.

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Book Reviews

VAN RIPER, CHARLES and BUTLER, KATHERINE G. *Speech in the Elementary Classroom.* New York: Harper and Bros., 1955. Pp. 177. $2.50.

Dr. Van Riper constantly surprises us by his excursions into new areas of the speech field. In this book, he and his co-author leave the speech clinic, the college classroom, and the home—foci of his previous books—to enter the elementary school classroom. The book by title, content, treatment, and intention is directed to the regular classroom teacher. In the preface, the authors say that 'the basic aim and function of this book is to give the classroom teacher the tools she needs to help not just the speech-defective children but all her pupils. Oral communication is so important in our lives that it must no longer be neglected in our elementary schools.'

The book consists of ten short chapters and an appendix, each chapter dealing with one phase of classroom speech improvement work. Most chapters begin with a description of one type of normal speech inadequacy, then go on to state the authors' rationale for the type of speech improvement activity needed, and finally provide concrete suggestions for carrying out such activity.

Chapter 1, *The Need for Training in Oral Communication,* presents a strong case for the urgency of systematic speech improvement training in the classroom, defines speech improvement, and discusses the relative roles of the classroom teacher and the speech correction teacher. Chapter 2, *Teaching and Talking,* presents the concept that teaching and talking are to a large extent synonymous, that the teacher's effectiveness as a teacher is to be evaluated largely in terms of her skill in oral communication. Similarly, the pupil's success as a learner is manifested principally in his increased skill in oral communication. Typical classroom activities involving speech, such as 'sharing time' and 'group planning and reports,' are described and suggestions given about how these can be used more effectively as opportunities for speech practice.

Chapter 3, *Speech Improvement Time,* argues that speech improvement, as a by-product of other activities, is not enough. There must be provision also for regular speech improvement periods at least once or twice a week in order to provide types of speech training which cannot be offered so well in regular activities. Several typical speech periods are described. Chapter 4, *The Alphabet of Sound,* one of the strongest chapters in the book, describes methods of training children in the articulation of the sounds which cause most difficulty.

Chapter 5, *Self-Hearing and Vocal Phonics,* also an important chapter, discusses the importance of self-monitoring and the need to develop this skill in children in order to insure permanent gains. The authors make an important contribution in stressing this skill which is too often omitted in books on speech improvement or even on speech correction. They describe a technique, 'vocal phonics,' for training children to analyze, then synthesize the separate sounds of words. Chapter 6, *Improving Fluency,* will probably be considered by most readers as somewhat more controversial than the others. The authors describe methods of eliminating non-fluency and of increasing fluency, and discuss the need and methods for extending and consolidating the pupil's oral vocabulary.

Chapter 7, *Thinking Aloud,* perhaps the most novel chapter, takes off from the Watsonian concept of thinking as sub-vocal speech and advocates training in thinking through training in oral verbalization of observations, feelings, ideas, and solutions. The authors state: 'First we get the postural responses of the children flowing freely in response to stimulation. Then we give them some experience in verbalized stream-of-consciousness utterance in the presence of that stimulation. Next we get them to do the running commentary on what is being perceived, carried out, or felt. Finally, we create a problem situation to which the children react by working out the solution through the oral expression of their think-

Book Reviews is edited by Ernest H. Henrikson, University of Minnesota.

ing. Training of this sort is basic to the skill of being able "to think on your feet," to express your thoughts coherently.' The authors' assumption is that unless a child learns to talk to himself fluently he will not learn to think fluently.

Chapter 8, *The Improvement of Voice*, is one of the best chapters in the book. It lists a number of useful techniques for developing improvement in pitch, loudness, quality, and inflection. Chapter 9, *Speech as a Safety Valve of the Emotions*, carries speech improvement beyond the scope of most books on the subject to embrace what almost amounts to a program of mental hygiene in the classroom. The chapter, indeed, points up the fact that there is no sharp line where speech leaves off and mental hygiene begins. This chapter would serve the purpose of school psychologists and guidance workers about as much as those of speech specialists. Chapter 10, *Helping Children with Speech Defects in the Classroom*, is fairly typical of other books on the subject. It deals particularly well with the handling of stutterers in the classroom. One danger in the chapter may be the implicit encouragement — without cautions — which it gives to teachers to undertake the correction of speech defects. The *Appendix* describes typical speech improvement lesson plans for several lessons, at each level from kindergarten through the sixth grade.

The book is written in the vivid, direct, interesting style which we have come to recognize as characteristic of Van Riper. Its non-technical, human approach will appeal to teachers. The descriptions of *normal* deviations in speech will be recognized by any observant classroom teacher as typical of her own pupils and will, therefore, capture and hold her interest.

Unlike some of the books on the subject —which often create the impression that speech improvement is something entirely different from what the classroom teacher normally does—this book describes many activities which are to be found in good classrooms and encourages the teacher to merely extend them further. Anyone who has tried to develop speech improvement programs will recognize the importance of this point, since experience shows that what seems foreign or too 'new' to teachers is likely to be resisted or, at best, undertaken with misgivings.

Another strong point of the book is its orientation toward speech, not as a mere collection of skills, but as a form of *behavior* and, therefore, as revealing of beneath-the-surface feelings and attitudes. Speech hygiene and mental hygiene are inseparably linked in the presentation, a wholesome point of view to encourage in classroom teachers.

The book unfortunately has some very serious weaknesses as an attempt to tell the classroom teacher 'exactly how to handle speech improvement in the elementary classroom,' to quote from the book's paper jacket. In the first place, the authors seem totally unaware of any previous publications in speech improvement. In speaking about texts they say there are 'few, if any, devoted to the child's oral communication.' This is simply not true. There are numerous books — some excellent — devoted to precisely this subject. The authors would have strengthened their own book immeasurably if they had taken previous books into consideration and had provided their readers with a well-selected bibliography. They give no bibliography at all, suggest no sources of materials, and give no leads to further sources of help. The somewhat immodest assumption of the authors is that everything the teacher needs to know will be found between the covers of their book. The teacher who accepts this assumption will be sadly disillusioned.

Another weakness is the author's overestimation of what the typical classroom teacher, usually untrained in speech, can do in speech improvement. They assume a background which rarely exists. For example, they mention that there are forty speech sounds in standard English, but fail to list them or even to give sources of this information. Anyone who has attempted speech improvement work with teachers knows that even this elementary information is usually lacking.

The authors do not give clear, positive objectives for speech improvement. The emphasis is largely negative—what to help the child to *stop* doing, not what to help him *to do*. There is almost no help given the teacher in analyzing the speech needs of individual pupils or of the class as a whole, although a knowledge of specific needs is fundamental to planning a sound program of speech improvement. On the over-all planning itself, the book also fails to give much help.

Although the authors suggest many excellent and ingenious activities, others are

highly questionable and betray somewhat less than extensive familiarity with the way classrooms and schools operate. Some activities are more suited to small clinic groups and would be ineffective or hard to handle in typical classrooms of 30 to 40 pupils with one teacher. There is also an unfortunate over-emphasis on oral gymnastics and phonetic placement. Classroom teachers are only too easily distracted by these concrete, easily taught activities and need greater encouragement to stress ear-training and the other more intangible types of activity.

The book represents a highly novel approach to speech improvement. It should be very useful as *one of several* to recommend to classroom teachers interested in speech improvement, or to use in the increasingly common college courses on speech improvement in the classroom. Alone it would fall far short of its objective. It will give teachers new insight into children's speech behavior and will challenge them to help in improving speech, but it will go only part of the way in showing them how to do it.

MARGARET HALL POWERS

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STRENG, ALICE, FITCH, WARING J., HEDGECOCK, LEROY D., PHILLIPS, JAMES W., and CARRELL, JAMES A. *Hearing Therapy for Children*. New York: Grune and Stratton, 1955. Pp. 371. $6.75.

The field of audiology has been slow in developing its literature. Probably this is due to the fact that most audiologists have been so completely absorbed in clinical activities that they have had little time or energy to devote to writing. The field desperately needs 'how to do it' books which can be used as texts or references in audiology courses. *Hearing Therapy for Children* is a recent addition to the books which have blazed the bibliographical trail in audiology.

This book, according to the authors' preface, was '. . . designed to include for the first time in one book the special skills and knowledge needed by members of those professional groups who work with hearing handicapped children.' It is unfortunate that the book has such an all-inclusive purpose. It attempts to do more than can be accomplished successfully in one book, with the result that it only touches on some of the 'special skills and knowledge' required by professional workers in the field of child audiology.

More than half of the book deals with the methodology of teaching deaf and hard-of-hearing children — particularly those of elementary school age. This part is a mixture of specific techniques, references to methods suggested by other writers, and the history of education of the deaf. In spite of some confusion in organization and a tendency to oversimplify teaching methods through the use of summarizing charts, this section justifies the book's existence. Teachers of hearing handicapped children should find much useful information in this section.

The first part of the book includes short chapters on the causes and treatment of hearing loss, school audiometry, clinical audiometry, and hearing aids. Presumably, these chapters were to serve as background material for the section dealing with teaching methods. The inclusion of these chapters, however, produces confusion as to the purpose of the book, and the audience to which it is addressed. In this reviewer's opinion, the book would be more useful had it been confined to an expansion of the material in the last three chapters—those dealing with educational methodology. Then the purpose of the book would have been clearly to provide pedagogic information to the teacher of the hearing handicapped child.

The book suffers from having been written by various authors. There are some inconsistencies from chapter to chapter, and some redundancy. As an example of inconsistency, frequency is referred to in terms of cycles per second throughout Chapter 3, but in terms of only double vibrations (a term almost never used by audiologists) in Chapter 4.

The chapter on hearing aids is well written, but, as the author of that chapter feared, it is already out-dated by the rapid development of the transistor aid. Today, a discussion of vacuum tube aids is only of historical interest.

Despite its shortcomings, and its inability to live up to its authors' lofty ambitions for all-inclusiveness, this book does serve a useful purpose as a reference for speech or education courses dealing with the hearing handicapped child.

HAYES NEWBY

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MULGRAVE, D. *Speech for the Classroom Teacher*. Third Edition. New York: Prentice Hall, Inc., 1955. Pp. 470. $5.75.

In the first two editions of *Speech for the Classroom Teacher*, the author attempted the extremely difficult task of combining all of the fields of speech under one cover. In the third edition, more adequate discussion in several of the parts of the book is possible by an increase of 47 pages with more room per page. Through careful selection and concise presentation of material, the author has made the most of the added space to bring out a better edition than previous ones.

The current edition is published in five parts as were the earlier editions. Part I deals with 'The Role of Speech in Teaching,' Part II with 'The Physiology of the Organs of Speech and Hearing,' and 'Training the Voice and Articulation for Normal Speakers.' This reviewer has found the discussion of the speech mechanism very valuable for classroom teachers. Another significant discussion is that in Part III, 'The Scientific Study of Language.' The presentation of the phonetic approach to the study of language is well done. The succeeding five chapters in Part III are clearly and interestingly written, providing a great deal of practice material. The phonetics material is based on the International Phonetic Alphabet and the standard of good speech presented here is that of 'Eastern Speech.' This limits the book in its appeal as a textbook for classroom use outside of Eastern States.

There are adequate chapters in Part V dealing with oral interpretation, dramatics, public speaking, group discussion, radio and television. Although there is nothing particularly new in these chapters, the material has been carefully selected and is well adapted for the classroom teacher.

Part V deals with speech pathology. There are chapters on the problem of speech pathology, functional speech disorders, organic speech disorders, and psychogenic speech disorders. It is in this part of the text that the author runs into very real and serious problems with respect to limitations of space. An attempt is made to discuss the entire field of speech pathology in 47 pages. Perhaps there is some danger in attempting this kind of presentation to the classroom teacher, since, in the field of speech disorders, considerable damage can be done by the inadequately informed person. For example, the problem of cleft palate is discussed in two short paragraphs with an additional two short paragraphs of corrective procedures. In the chapter on psychogenic speech disorders, delayed speech is discussed in one paragraph and there are two short paragraphs of corrective procedures. The possibility of damage is obvious.

In spite of these limitations, the author has handled the discussion of speech problems with a great deal of care and has made every effort to explain to the classroom teacher what she may and may not safely attempt. A great service is done by the repeated emphasis on the classroom teacher's cooperating with the speech therapist and other specialists. At the same time, a realistic point of view is taken in suggesting that, where no special help is available, the classroom teacher should proceed with those things which she feels safe in doing. The brief discussion of stuttering, for example, is well done from this point of view; a classroom teacher who reads and understands this section would more adequately approach the problem of handling a stuttering child in her classroom.

In spite of the problems encountered in trying to cover too much in too little space, this reviewer believes that this book can be used to advantage in courses for classroom teachers or by classroom teachers if it is used with an understanding of the limitations mentioned.

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PATTON, R. A., WILSON, J. T., FORD, C. S., SKINNER, B. F. BERGMANN, G., BEACH, F. A., and PRIBRAM, K. *Psychology and the Behavioral Sciences*. Pittsburgh: Pittsburgh Press, 1954. Pp. 142. $4.00.

This is a timely and interesting volume of lectures in keeping with current trends in psychology and allied fields in the behavioral sciences. First given the Mellon Institute, Pittsburgh, the lectures were later collected into one volume under the auspices of the Department of Psychology at the University of Pittsburgh. In the first chapter, there is a brief statement by Patton concerning the concept of how organisms behave under stress. According to Patton, stress exists in those conditions which threaten the attainment of certain goals by the individual. It causes the individual's behavior to oscillate beyond its normal bounds, and to return more slowly to its usual state.

In the second chapter, Wilson defines psychology and the behavioral sciences as formerly described by Clark Hull. He maintains that the subject calls for a series of treatises on different aspects of behavioral sciences, such as: (a) a general theory of behavior and (b) a general theory of social behavior. Sub-divisions should include work on a number of areas, such as: communicational symbolism of language, uses of symbolism in problem solution, and social or ritualistic symbolism.

Wilson discusses the impetus of World War I in bringing psychologists into world affairs, and in promoting a growing consciousness of the scientific aspects of behavior. Social psychology and personality began to be discussed and the consideration of group dynamics was considerably extended. Recently, social engineering and social philosophy have been blended in behavioral science studies showing the approchement between these and psychology.

In the next chapter, Ford discusses the contributions of anthropology to psychology. He shows that anthropologists have long been interested in detailed analysis of social and political organization of certain cultural and ethnic groups. The data which they have obtained is of increasing interest to the psychologist because of his studies of structure and culture of various areas of society. Whereas the anthropologist studies people, the psychologist too often has to rely upon a study and observation of animals, as people do not like to be 'studied.'

Following this is a chapter by Skinner on the science of learning and the art of teaching. New methods of shaping behavior and maintaining its strength have been found as shown in a report of learning experiments with pigeons. Success with pigeons was contrasted with the unsuccessful learning processes found in the classroom in the lower grades. According to Skinner, the child reacts chiefly from fear of punishment or ridicule or displeasure of the teacher, low marks, or the principal's scolding. Lack of a skillful program for learning is a serious shortcoming, and even the best schools are inefficient in teaching such drill subjects as arithmetic.

Bergmann's chapter defines reduction as putting something into relation with something else. Specific examples are presented to show that science is always looking for such processes. The author finds that physical and physiological theory are systematic; theory in social science is also systematic in intent; psychological theories are mainly historical and stated in behavioral terms and cannot be reduced to mathematical terms, he claims. Therefore, the author believes that its reduction to physiological concepts is doubtful.

The next author, Beach, describes Dr. Spitz's report concerning children's need for love and attention, even in the earliest months of life. Orphanage children, despite adequate care, diet, and medical attention, developed many peculiarities; they were undersized, many failed to talk, and showed the effect of almost total lack of social stimulation. The author discusses the part that learning and experience play in the development of perception. One of the most important and universal conditions affecting development is the stimulation received from the environment. Experiments with rats, chimpanzees, birds, and other animals are quoted to support this point. Applications of these findings to human behavior are presented.

The final chapter by Pribram points toward a Science of Neuro-psychology. His studies with animals deal with the relation of brain and behavior in 40 monkeys. A detailed study of the effects of cortical lesions was made to relate specific neural systems to such specific behavior processes as visual choice reactions and visual discrimination. From this type of research it is expected that a common framework relating physiological and behavioral sciences will emerge.

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Abstracts

Acoustic Trauma

SALTZMAN, M. and ERSNER, M. S. Pathogenesis of acoustic trauma. *Mod. Med.* 23 (24), 1955, 127.

The authors describe three types of acoustic trauma; those caused by exposure to factory noise, those due to exposure to detonation of a cannon or rifle, and those resulting from progressive degeneration after traumatic injury. Remedial procedures are recommended.

(*B. S. Street*)

Adolescence

RUBE, P. Adolescence (part I). *Psychoanal. Rev.*, 9, 1955, 503-509.

This article, first in a series of three, deals primarily with the definition and meaning of adolescence and the great need for adult understanding of this problem. No definition is given; rather, adolscence is described as a cyclical, dynamic concept, manifesting itself in many individual areas and at different stages of development. The author compares this 'second birth' to the worm, cocoon, butterfly cycle. He stresses that this analogy and its implication for changes is of greater importance than may appear.

(*J. G. Sheehan*)

Abstracts is edited by William Tiffany, University of Washington, assisted by the following committee: Asa J. Berlin, Pennsylvania State University; Virginia B. Carroll, Minneapolis Veterans Hospital; Frederic L. Darley, State University of Iowa; Clair N. Hanley, University of Washington; Inez E. Hegarty, Mt. Holyoke College; Parley W. Newman, Utah State Agricultural College; John J. O'Neill, Ohio State University; John M. Palmer, University of Washington; Maryjane Rees, Sacramento State College; Frank B. Robinson, Miami University; Vivian I. Roe, University of Indiana; Bernard B. Schlanger, Vineland (N. J.) Training School; Joseph G. Sheehan, University of California; Barbara S. Street, Minneapolis Veterans Hospital; Wayne L. Thurman, Eastern Illinois State Teachers College.

RUBE, P. Adolescence (part II). *Psychoanal. Rev.*, 9, 1955, 673-691.

This article, second in a series of three, begins with a discussion of the concept of 'normality.' The author explains adolescent withdrawal, progressively poorer school work, and the psychotic-like tendencies of the adolescent. There is a discussion of the image of one's self in adolescence and the problem of choice. The adolescent is said to be constantly struggling with his self-created unreal world and the external world of reality.

(*J. G. Sheehan*)

Anoxia

LUFT, U. and NOELL, W. Manifestations of brief instantaneous anoxia in man. *J. appl. Physiol.*, 8, 1956, 444-454.

Two male adults were subjected to experimentally induced brief periods of anoxia. Photographs, tape recordings, EEG tests, and tests of manual dexterity revealed three consecutive phases of behavior with neurological signs similar to those associated with epileptic seizures. These phases were: (1) a state of automatism, characterized by confusion, poor judgment, and amnesia, (2) a phase of arrest, shown by lack of spontaneous movement, fixed eyes, and respiratory arrest, and (3) a final stage of failing posture.

(*I. E. Hegarty*)

Aphasia

BIRCH, H. and LEE, J. Cortical inhibition in expressive aphasia. *Arch. Neurol. Psychiat.*, 74, 1955, 514-517.

Fourteen right-handed patients with right hemiplegia and expressive aphasia resulting from cerebral vascular accidents were given four language tests. The subjects were asked to name objects, name pictures, read single words orally, and read connected sentences aloud. These four tests were presented under two conditions: (1) in a quiet room and (2) with binaural auditory stimulation of 256 cps at 60 db presented thirty seconds before the initial task and continued through-

out the tests. Without auditory stimulation, all patients had great difficulty in one or more tests. In ten patients, performance was reported to be much improved with auditory stimulation. Some residual after-effect was noted for a ten minute interval. The writers conclude that their findings suggest a theory of aphasia as an inhibitory defect and that further study will offer additional diagnostic and therapeutic aid to aphasic adults.

(*I. E. Hegarty*)

Froeschels, E. Zur sprachheilkunde. *Sprachforum*, 1, 1955, 34-41.

The author states that the difficulties in defining the courses of aphasia arise from three sources: (1) experiments on humans are nearly impossible, (2) animal experiments are inconclusive and, (3) the findings in support of localization of injury are few and disputed. Some people are said to function visually, some motorically. As a result, the destruction of Broca's area does not always lead to concurrent speech disturbances. Those who function visually are said to suffer less damage when Broca's area is impaired. According to the author, clarification of the problem of aphasic symptomatology can come through the study of normal thought processes and speech. The article concludes with a discussion of some findings in experimental phonetics related to voice production.

(*B. B. Schlanger*)

Longerich, M. C. Helping the aphasic to recover his speech: A manual for the family. College of Medical Evangelists, School of Medicine, Los Angeles, California, 1955, pp. 7.

Suggestions are offered to members of the aphasic's family. These include social preparation for speech, coping with the patient's problems, and home speech therapy.

(*B. B. Schlanger*)

Riese, W. Hughlings Jackson's doctrine of aphasia and its significance today. *J. nerv. ment. Dis.* 122, 1955, 1-13.

The doctrine of Hughlings Jackson, according to the author, regarded speech as a propositional unit and maintained inner speech was necessary in order for the patient to read, write and reason. Jackson disagreed with the theory of specific speech centers and advanced the theory of cerebral dominance to account for the functioning of language. The influence of Jackson's doctrine of aphasia on the theories of Freud, Head, and Goldstein are analyzed and discussed. The author discusses the unusual problems which are present with aphasic patients who have reached high intellectual achievements. A case history and auto-observations of such a patient are presented.

(*B. S. Street*)

Snidecor, J. C. A method of disparities for evaluating aphasic disturbances. *J. nerv. ment. Dis.*, 122, 1955, 92-93.

The author describes a technique which he has developed for the evaluation of aphasic patients. This technique is designed to reduce the emotional blocking and brain-damaged behavior which is frequently reported to be a problem with aphasic patients. The method involves the use of test items presented with a discrepancy between the object's function as represented in a picture or problem and the verbal reference to it. The patient's responses to these 'errors' are said to be made with less frustration and delay and are thought to indicate more real (and higher) levels of performance than is obtained under usual testing methods. Two case histories of aphasic patients are presented and the use of the test items is demonstrated to support the potential of the test. The author finds the method useful as a therapy technique as well as a measure of achievement. Further research to evaluate this technique is recommended by the author.

(*B. S. Street*)

Stengle, E., and Lodge Patch, I. C. 'Central' aphasia associated with parietal symptoms. *Brain* 78, 1955, 401-416.

Three case histories of patients described as having central aphasia are presented. Central aphasia is defined by the authors as referring to a lesion in the center of the hypothetical speech area and as a disorder chiefly affecting inner language. In each of the three cases, the ability to repeat words heard was severely impaired while the understanding of spoken language was least impaired. Each patient seemed to be aware of his speech disorder. In each case, the speech disorder was associated with symptoms indicative of damage to the parietal area of the dominant hemisphere. The presence of a parietal lesion was verified in one

case by autopsy and in another by biopsy.

The authors conclude that the syndrome described as central aphasia is an incomplete receptive aphasia with impairment of the patient's ability to repeat. It is the combination of an incomplete lesion of the temporal region with extensive damage in the parietal area.

(*B. S. Street*)

Atresia

McAskile, K. and Sullivan, J. A. Surgical management of congenital atresia of the ear. *J. Laryng. Otol.*, 69, 1955, 765-785.

Congenital atresia is treated by these authors as a hearing problem requiring surgery. Embryologic development and maldevelopment is discussed. The writers state that unilateral cases should not routinely be operated unless the reasons are important, while bilateral cases should be operated if good cochlear function has been determined and the optimal age of four years has been reached. A review of surgical technics, including the authors' is given. Eight cases are described with pre- and postoperative audiometric studies presented. There is a 26-item bibliography included.

(*J. M. Palmer*)

Attitude Scaling

Webb, S. C. Scaling of attitudes by the method of equal-appearing intervals: a review. *J. soc. Psychol.* 42, 1955, 215-239.

The author reviews the work of Thurstone and a large number of experimental and methodological studies. The latter are grouped under nine headings: collecting judgments, computing scale and Q values, end effect, assumption of equal appearing intervals, elimination of judges, assumption of independence of scale values and attitude of judges, number of judges, number of intervals, and effect of question form and content. A seventy-two item bibliography is given.

(*W. L. Thurman*)

Audiometry

Corso, J. F. Effects of testing methods on hearing thresholds. *Arch Otolaryng., Chicago*, 63, 1956, 78-91.

Comparisons are made between testing methods using the method of limits and the method of adjustment. A standard commercial audiometer (pure tone) and the Reger model of the Bekesy-type audiometer are employed. The author concludes: 'In general, there is a statistically significant, but rather low, positive correlation between individual thresholds obtained at a given frequency by the method of limits and those obtained by the method of adjustment, using either the "midpoint" or "peak" readings on the Bekesy-type audiograms.'

(*J. M. Palmer*)

Audiometry and Mental Ability

Bradley, E. Evans, W. E. and Worthington, A. M. The relationship between administration time for audiometric testing and the mental ability of mentally deficient children. *Amer. J. ment. Def.*, 60, 1955, 346-353.

Sixty mentally defective children between the ages of 7-13, with an IQ range of 30-70, were administered two types of audiometric tests. These were a standard type of test and an alternate ear choice type of test. The test results indicated that the amount of time required to test the subjects was significantly related to their mental and chronological ages. Also, the standard type of audiometric test was more rapid and just as accurate as the alternate ear choice type of test.

(*J. J. O'Neill*)

Auditory Cortex Lesions

Tunturi, A. R. Effect of lesions of the auditory and adjacent cortex on conditioned reflexes. *Amer. J. Phys.*, 181, 1955, 225-229.

Experimental animals (dogs) were conditioned to respond to pure tones of varying frequencies and intensities by raising a different leg to different tonal presentations. Surgical lesions were performed following the conditioning period and the animals were tested subsequently to determine if these lesions, around the auditory area, affected auditory training. 'No permanent effect on conditioned leg responses to sound and tactile stimuli was observed in dogs from which the suprasylvian gyrus was removed bilaterally.'

(*C. N. Hanley*)

Auditory Threshold Recovery

Hirsh, I. J. and Bilger, R. C. Auditory-threshold recovery after exposures to pure

tones. *J. acous. Soc. Amer.*, 27, 1955, 1186-1194.

Five untrained listeners were exposed to a 1000 cps tone at sensation levels of 20, 60, 80, 90, and 100 db, for durations of 10, 15, and 30 seconds and 1, 2, and 4 minutes. Before and after each of these exposures, the absolute threshold was measured as a continuous function of time. One set of thresholds was obtained for 1000 cps and another for 1400 cps. A modified Bekesy-type audiometer was utilized for the experiment. It was found that exposure of the human ear to various durations and levels of a 1000 cps tone results in the elevation of the absolute threshold for both 1000 and 1400 cps. This temporary hearing loss gradually diminishes as a function of time and is said to be dependent upon intensity and duration of exposure in ways which 'point to more than one underlying recovery process.'

(*V. B. Robinson*)

Brain Damage

ELITHORN, A. A preliminary report on a perceptual maze test sensitive to brain damage. *J. Neurol. Neurosurg. Psychiat.*, 18, 1955, 287-292.

A 30-pattern maze test is reported to reveal changes in patients with frontal lobe and anterior temporal lobe damage. The test requires the subject to connect the greatest number of dots possible on a set of pathways while maintaining a forward direction. Time limit is one minute. The mazes are progressive in difficulty and appear to measure visuo-spatial scanning ability. Results of testing are as follows: (1) patients with a modified leucotomy scored somewhat better than those with a full leucotomy, (2) both groups showed an increment post-operatively, and (3) temporal lobectomy patients showed a decrement post-operatively. Test-retest reliability showed a correlation of .81 with 18 patients. The test is reported to correlate negatively with age and to correlate significantly with estimations of intellectual ability as measured by the Wechsler vocabulary and Koh's block sub-tests. It also is said to be related to post-operative social adjustment.

(*V. B. Carroll*)

GALLAGHER, J. J., BENOIT, E. P., and BOYD, H. F. Measures of intelligence in brain damaged children. *J. clin. Psychol.*, 12, 1956, 69-72.

Forty institutionalized brain damaged children, ranging in age from 7 years, 4 months to 13 years, 10 months, were given the Stanford Binet, the Columbia Mental Maturity Scale, and the Leiter International Performance Scale. The purpose was to determine if these tests were comparable when an atypical population is involved. Findings are said to indicate: (1) the correlations are high for all three tests, (2) the means are significantly different, particularly between the Binet and CMMS, (3) the CMMS agrees with the Binet to an MA of 4-7 years, then discrepancies become marked, and (4) the LIPS shows its best agreement above an MA of 4-6 years. The authors conclude that the tests cannot be assumed comparable and they caution that non-verbal tests should not be used to the exclusion of other measures.

(*V. B. Carroll*)

GHENT, L., WEINSTEIN, S., SEMMES, J., and TEUBER, H-L. Effect of unilateral brain injury in man on learning of a tactual discrimination. *J. comp. phys. Psychol.*, 48, 1955, 478-481.

Thirty-six adult subjects with unilateral brain injury (eleven aphasics) and nineteen control subjects with peripheral leg injuries, were presented with six patterns to be recognized by tactual discrimination. With the stimulus blocks hidden from view, each subject was asked to select and match identical patterns with the palm of each hand. Results indicated that the control subjects improved their learning of this discrimination in each hand. For the brain-injured group, the hand on the same side as the brain-injury improved like the control group. However, the hand opposite the cortical lesion did not show improvement. The lack of improvement was not related to sensory changes nor to location of cortical injury.

(*I. E. Hegarty*)

REITAN, R. M. The relation of the trail making test to organic brain damage. *J. consult. Psychol.*, 19, 1955, 393-394.

The Trail Making Test was administered to 27 brain damaged and 27 hospitalized control subjects who were matched in pairs for sex, color, age and education. This test is one of the performance subtests of the

Army Individual Test and consists of two parts. Part A requires the examinee to connect with a pencil line 25 numbered circles printed on a sheet of paper, proceeding in order from one to 25. Part B consists of 13 numbered and 12 lettered circles; the subject is instructed to alternate between numbers and letters. The tests were scored as to the number of seconds required for completion. Significant intergroup mean differences were found on both parts as well as on the sum. The results confirmed Armitage's findings that this short, inexpensive, and easily administrated test may be a fairly valid indicator of certain effects of brain damage. Further testing aimed toward establishing norms of individual subjects in clinical settings is recommended by the author.

(*B. S. Street*)

Case Reports

STITT, P. G. Who wants to know? *Children*, 2, 1955, 213-216.

In a discussion of inter-agency communication, the author points out that case reports should meet the needs of the recipient. This can be done best if the recipient of the information indicates how the anamnesis is to be used. The author urges that instead of presenting miscellaneous data, the case report should be a thoughtful presentation of selected features which are individualized in specific terms of practical meaning to the recipient.

(*B. B. Schlanger*)

Cerebral Lesions

REITAN, R. Certain differential effects of left and right cerebral lesions in human adults. *J. comp. physiol. Psychol.*, 48, 1955, 474-477.

A battery of tests including the Wechsler-Bellevue Scale, the Halstead-Wepman Aphasia Screening Test, and the Minnesota Multiphasic Personality Inventory was administered to fourteen patients with left hemisphere lesions, to seventeen subjects with right hemisphere injury, and to thirty-one patients with diffuse brain damage. All patients were righthanded; eight of the first group had mild aphasic symptoms. The study presents the findings from the Wechsler-Bellevue testing, showing that thirteen of the fourteen patients with left hemisphere lesions had lower verbal scores than performance scores, that fifteen of the seventeen subjects with right hemisphere lesions had higher verbal scores than performance scores, and that those with diffuse brain damage had verbal and performance scores equally distributed. The author raises the question of the relationship between intelligence and aphasia, suggesting that if aphasia is considered a specific language problem, the Wechsler-Bellevue test is not applicable. If aphasia is considered a general intellectual problem, the Wechsler-Bellevue test on the group studied is said to demonstrate lowered intellectual capacity.

(*I. E. Hegarty*)

Cerebral Palsy

BOST, F. C., ASHLEY, R. K., and KELLY, W. J. Role of the orthopedic surgeon in treatment of cerebral palsy. *J. Amer. med. Ass.* 160, 1956, 256-258.

The authors discuss the place of the orthopedic surgeon in the treatment of cerebral palsy and examine the circumstances that have led to the alleged depreciation of surgical treatment. The evaluation of treatment for cerebral palsy is reviewed and the present status of surgery appraised. Clinical results of surgery in 354 operations are cited in evidence of a strong need for the orthopedic surgeon on the cerebral palsy team. The author emphasizes the need for 'integration of the efforts of the members of the team into the master plan of treatment.'

(*W. L. Thurman*)

LONGERICH, M. C. Speech for the cerebral palsied pre-school child: A parent's manual. College of Medical Evangelists, School of Medicine, Los Angeles, California, 1955, pp. 11.

General hints are given for stimulating speech, and speech muscle exercises and procedures for developing words are outlined for parents of pre-school cerebral palsied children. A list of suggested readings is appended.

(*B. B. Schlanger*)

DOOB, D., BOLES, G. and BOBRICK, G. Simultaneous group meetings of cerebral palsied children and their parents. *Educ. Res. Bull., Ohio St. Univ.*, 34, 1955, 141-152.

A program of group work for thirteen cerebral palsied children and their parents is described. The outstanding trends of the

parents' discussions are presented. The program is evaluated with respect to gains made by the children and their parents.

(*W. L. Thurman*)

Certification

IRWIN, R. State programs in speech and hearing therapy: II certification. *Speech Teacher*, 4, 1955, 253-258.

This is the second of a series of three articles dealing with state speech and hearing programs. The growth of state certification requirements is discussed. Information regarding certification was obtained from state directors of special education or supervisors of speech and hearing therapy. Detailed data is presented on requirements in thirteen states to supplement an earlier article (1953) by this author. Numbers of therapists working in state programs with and without certificates as well as numbers of known vacancies are listed.

(*W. L. Thurman*)

Classroom Teacher

EMERY, R. M. The classroom teacher and speech correction. *Elem. Sch. J.*, 56, 1955, 110-116.

Simplified basic information relative to speech defects is offered to the classroom teacher. Included is a speech referral form which contains a symptomatic check list to be used by teachers.

(*B. B. Schlanger*)

Cleft Palate

BADEN, E. Prosthetic therapy of congenital and acquired clefts of the palate. *J. Hist. Med.*, 10, 1955, 290-301.

This is an historical review of palatal prostheses from antiquity to the present. Therapies for both congenital and acquired clefts are considered. Essential characteristics of the appliances and theoretical considerations leading to their designs are discussed. Continued progress in cleft palate rehabilitation is said to require close cooperation between the surgeon and the prosthedontist.

(*A. J. Berlin*)

BEERS, M. D. and PRUZANSKY, S. Serial growth studies of the head of an infant with mandibular micrognathia, glossoptosis and cleft palate following the Beverly Douglas operation. *Cleft Palate Bulletin*, 5(4), 1955, 12-13.

The Beverly Douglas operation of suturing the tongue to the lower lip was performed on an infant as a life-saving procedure because the tongue in the very small jaw was closing the pharyngeal air passage. Six cephalometric roentgenograms from 10 days to 15 months of age clearly demonstrate the increasing adequacy of the airway and the improvement in the facial profile.

(*A. J. Berlin*)

GAISFORD, J. C. The surgically acquired cleft palate. *Cleft Palate Bulletin*, 5(4), 1955, 13-14.

The author urges surgeons, speech therapists, and prosthedontists to cooperate in the rehabilitation of the frequently neglected group who acquire clefts as the result of surgical resection of the palate.

(*A. J. Berlin*)

MACCOLLUM, D. W. and RICHARDSON, S. C. Recent evaluation of cleft palate speech—a preliminary report. *Cleft Palate Bulletin*, 5 (4), 1955, 5-8.

This is the preliminary report of a study of two groups drawn from a population of 1034 early palatoplasties done by the same surgeon. The average operative age of the 143 children seen so far was 19 months. Eighty per cent of this group are reported to have non-nasal speech. Palatal length and pharyngeal movement were found to be related to speech adequacy; all the children with good speech showed unusually marked lateral pharyngeal activity.

(*A. J. Berlin*)

MARCKS, K. M., TREVASKIS, A. E., and TUERK, M. Some observations in cleft palate surgery. *Cleft Palate Bulletin*, 5 (4), 1955, 10-12.

The authors describe specific surgical techniques which they have used successfully to close palatal clefts in children from 1½ to 5 years of age.

(*A. J. Berlin*)

Nutrition. *Sci. News Lett.*, 69, 1956, 53.

This article reports a study of various congenital anomalies, including cleft palate and cleft lip, produced in experimental rats by severe dietary deficiencies in early pregnancy. A fourteen day deficiency of

riboflavin and pantothenic acid and a forty-eight hour deficiency of folic acid, vitamin B, within a seven-to-twelve day period produced congenital abnormalities similar to those found in man.

(*I. E. Hegarty*)

SWANSON, L. T. A cephalometric evaluation of one hundred patients who have had cleft palate repairs. *Cleft Palate Bulletin*, 5 (4), 1955, 8-10.

The 100 patients studied for this report ranged in age from 3½ to 17 years; the majority had palatoplasties between 13 and 18 months of age. Several angular measurements made from lateral cephalometric roentgenograms are reported with comparative figures for normal controls. The findings do not corroborate the assumption of normal mandibular growth in cleft palate cases.

(*A. J. Berlin*)

Competing Messages

WEBSTER, J. C. and SHARPE, L. Improvements in message reception resulting from 'sequencing' competing messages. *J. acoust. Soc. Amer.*, 27, 1955, 1194-1198.

'Ten naval personnel heard tape-recorded messages in control tower phraseologies over four channels. Any of four stations could be called over any channel. On three of the channels the operator controlled the playback of the messages by means of controls that allowed him to start and/or mute messages. The operator had no control over when the messages came in over the fourth channel although he had provisions for muting it. The muting was used to silence messages that the subject was not required to respond to and was employed for one-half of the test conditions. Each message contained twenty bits of information and was approximately five seconds long. In each half hour test session 378 messages were presented. Listening conditions ranged from having the operator respond to only one station with muting to answering three stations without muting. The results indicated slight but statistically significant increases in errors and in the times necessary to complete the jobs as the response task increased from one to three stations. Most errors occurred on the channel over which the operator had no sequencing control. For the message rates and density used in these experiments the operator could handle three stations with sequencing almost as accurately as he could handle one station without sequencing.'

(*Author's precis*)

WEBSTER, J. C. and SOLOMON, L. N. Effects of response complexity upon listening to competing messages. *J. acoust. Soc. Amer.*, 27, 1955, 1199-1203.

Three groups of twelve men listened to sequences of two, three, or four competing messages. Two conditions of filtering and two of spatial separation were employed. At times the groups responded to one message and at other times to two. The first group wrote down the contents, the second group spoke the contents of the message to a partner who wrote it down, and the third group decoded the message content before writing it down. Results indicated: (1) twice as many errors occurred when responding to two messages instead of one, (2) decoding or talking produced an increase in frequency of errors of 10 per cent over writing, and (3) errors increased as listening aids decreased.

(*B. B. Schlanger*)

Communication

BLOCK, J. and BENNETT, L. The assessment of communication. *Hum. Relat.*, 8, 1955, 317-325.

Employing the reciprocal Q-sorting technique with factor analysis, this study investigated the reactions of one subject, a clinical psychologist, to twenty-three individuals, and the reactions of twenty-one of these persons to the principal subject. The accuracy of the subject's own evaluation of her effectiveness with various individuals varied with the interpersonal relationship. Two levels of distortion of the self-evaluation were noted. On occasion, the subject did not perceive the messages being communicated. Secondly, the subject did not influence the social situation as she intended.

(*I. E. Hegarty*)

PETERSON, G. E. An oral communication model. *Language*, 31, 1955, 414-427.

The purpose of this article is to present a discussion of the basic processes involved in oral communication, and to make a critical evaluation of the relationships among them. The communication process is described in terms of the servo mechanism of speech and

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the major processes involved. These are, the nervous system, motor production, acoustical structure and speech reception. Study of the basic properties of speech is said to require the use of experimentation with listeners. According to the author, such experimentation should lead to a description of speech that is a coherent combination of physiological and acoustical terms. Theoretical formulations in structural linguistics should take account of the physiological speech mechanism as an information source.

(*J. J. O'Neill*)

BAKER, S. J. The theory of silence. *J. gen. Psychol.*, 53, 1955, 145-167.

The fundamental basis for any communication act rests in the reciprocal relationship between speaker and hearer. The communication act is said to be conditioned by the nature of ego control, the nature and strength of intra-personal tensions and the depth of reciprocal identifications. The underlying aim of speech is not a continued flow of speech but silence. According to the author, there are two types of silences. The first type is brought on by acute anxiety and is a negative form of silence. The positive type of silence occurs when there is close identification and a lack of psychic tension. Word breakdowns occur with increase of intra-personal tension and shrinkage in the field of identification. The theory of silences is applied to speech disorders, especially non-organic speech disorders and paraphasias.

(*J. J. O'Neill*)

Cortical Hearing

BOCCA, E., CALEARO, C., CASSINARI, V. and MIGLIAVACCA, F. Testing 'cortical' hearing in temporal lobe tumours. *Acta Otolaryng.*, 45, 1955, 289-304.

Eighteen patients suffering from supratentorial cerebral tumours were administered a new type of speech reception test. The test consisted of a recording of 10 disyllabic words which were distorted by being passed through a 1000 cycle low pass filter. The tests were presented monaurally, through earphones. Thirteen of the subjects received lower reception scores for the ear contralateral to the site of the lesion. The authors postulate that the test could serve as a diagnostic aid in ascertaining if a supra-tentorial tumour did exist. They further suggest that such a test evaluates the integrative behavior of the temporal cortex and as such could be employed in the testing of functional defects not picked up by other tests.

(*J. J. O'Neill*)

Earmuff Design

ZWISLOCKI, J. Design and testing of earmuffs. *J. acoust. Soc. Amer.*, 27, 1955, 1154-1163.

'Factors controlling the sound attenuation provided by earmuffs are analyzed and an upper limit is estimated of the attenuation that can be expected from simple earmuffs without sacrificing comfort. Further discussion concerns the best dimensions of the earmuff and what can be achieved by adding one or more Helmholtz resonators. The sound attenuation provided by two different earmuffs was determined on eight subjects in three sessions with a Bekesy audiometer. The experimental procedure is described in detail and the results are analyzed statistically. Special attention has been paid to the changes in the listenter's threshold of audibility with increasing experience.'

(*Author's precis*).

Fenestration Surgery

LEMPERT, J. Surgical remobilization of the inner ear fluids for the improvement of hearing in middle ear deafness. *Trans. Amer. Acad. Otolaryng.*, 59, 1955, 166-174.

The author describes his technic and rationale for reconstruction of the external and middle ear. A tympanomeatal flap covering the new fenestra is made in such a way as to create a new tympanic air space. This flap and space are responsible for phase and intensity differences in sound reaching the round window and new fenestra, thus providing for a more 'normal' inner ear response.

(*J. M. Palmer*)

VENKER, J. The reaction of the cochlea following a fenestration operation. *Arch. Otolaryng., Chicago*, 63, 1956, 21-24.

'During a five-year period, 402 fenestration operations were performed. Results were unsatisfactory in 23.6% of cases. The main cause of failure was the postoperative reaction of the labyrinth, which is probably attributable to lavage when the horizontal semi-circular canal is opened with a fluid

differing in composition from perilymph and, moreover, hypotonic. A fluid was, therefore, made up which approached perilymph in these properties. Only this fluid was used when the fistula was open. The outcome was that unsatisfactory results among the last 77 fenestrations were in no case attributable to the postoperative reaction of the labyrinth.'

(*Author's precis*)

Finnish Consonants

LINDBLOM, E. M. On Finnish consonant phonemes and their comparison with corresponding English phonemes. *Language Learning*, 5, 1955, 88-93.

A detailed analysis of consonant differences between Finnish and English is presented. Specific topics discussed include consonant sounds of English not found in Finnish and three others that, although present in Finnish, are not phonemic.

(*F. B. Robinson*)

Formant Extraction

FLANAGAN, J. L. Automatic extraction of formant frequencies from continuous speech. *J. acoust. Soc. Amer.*, 28, 1956, 109-118.

'Two electronic devices for automatically extracting the first three formant frequencies from continuous speech are described. Both devices are designed to yield three continuous dc output voltages whose magnitudes, as functions of time, represent the formant frequencies of the input speech. The principles of operation and the design features of both devices are discussed, and typical examples of the operation of each are presented.'

(*Author's precis*)

FLANAGAN, J. L. Evaluation of two formant-extracting devices. *J. acoust. Soc. Amer.*, 28, 1956, 118-125.

'A procedure for evaluating the operation of two electronic formant extractors is described and results of the evaluation are given. The formant extractors are designed to yield electrical outputs representing the formant frequencies of continuous input speech. These outputs are compared in a prescribed manner to formant data derived from sound spectrograms. The results show that the more reliable extractor of the two follows the first formant of vowel sounds in speech within ±150 cps greater than 93% of the time; it follows the second formant within ±200 cps greater than 91% of the time. The first and second formant outputs of the same extractors are simultaneously within the above tolerances greater than 85% of the time.'

(*Author's precis*)

Genetics

TRANKELL, A. Aspects of genetics in psychology. *Amer. J. hum. Genet.*, 7, 1955, 264-276.

According to the author, the psychologist who attempts to acquire genetic information from a study of behavior encounters certain special problems. The most complicated of these problems is said to be the influence of environment on inherited traits. Traits presumably inherited according to the classical Mendelian principles may be modified by environmental influences before data are obtained. Lefthandedness, schizophrenia, and dyslexia are discussed within this frame of reference.

(*F. B. Robinson*)

Group Behavior

TAYLOR, F. K. The three-dimensional basis of emotional interactions in small groups. I. *Hum. Relat.*, 7, 1954, 441-471.

The emotional behavior of therapeutic group members was studied by using the members as observers. The feeling which a subject entertains towards each of his group partners and the feelings which a subject assumes the various group partners entertain toward him were studied by a number of ranking techniques. They were analyzed in terms of a public dimension, a dyadic dimension and an autistic dimension. The appendix includes a description of the tests and the basic computational procedure used.

(*J. G. Sheehan*)

Group Therapy

LEARY, T., and COFFEY, H. S. The prediction of interpersonal behavior in group psychotherapy. *Group Psychother.*, 7, 1954, 7-51.

The author presents a summary of studies undertaken by the Kaiser Foundation Research Project which had as their aim the prediction of interpersonal behavior in psy-

chotherapy. Charts, ratings, graphs, and methodological devices are presented. The resulting profile of Variability Indices provides a method for anticipating the amount, the kind and the temporal sequence of variability in interpersonal behavior during psychotherapy.

(*J. G. Sheehan*)

SCHEIDLINGER, S. Concept of identification in group therapy. *Psychoanal. Rev.*, 9, 1955, 661-672.

The author reviews some of the literature on identification, pointing out that the concept of identification, due to confusion and generalization, is used synonymously with the concept of transferance and 'object-ties.' He presents specific categories of identification and stresses that there must be a distinction made between the role of identification in all psychotherapy as contrasted with its role in group dynamic phenomena.

(*J. G. Sheehan*)

Hearing Aids

KODICEK, J. and GARRAD, J. The hearing aid in use. A survey of 1459 patients. *J. Laryng. Otol.*, 69, 1955, 807-820.

Results of a survey of 1459 deafened patients are presented, of whom 865 adults were known to be using their 'Medresco' hearing aids. Data is presented regarding the usefulness of the aid, the time per day used, where used, occupational use of aid, sex differences in use of the aid, age differences, and criticisms of the state-issued aid. Ancillary aspects such as lipreading, social groups, auditory training, speech therapy and sympathetic handling by social and psychological agencies are emphasized.

(*J. M. Palmer*)

Hearing Impairment

HARDY, W. G. and BORDLEY, J. E. Treating young children for hearing impairment. *Children*, 2, 1955, 173-178.

The authors report that during the past five years, the Hearing and Speech Center of the Johns Hopkins Hospital has examined over 2000 children under six with hearing difficulties. In this report the causes of the hearing impairments are summarized, and selected case histories and audiograms are discussed. The problems of hearing aid use by children are discussed and it is emphasized that the time for providing the aid must be set for each child according to his readiness and needs. Most children with impaired hearing are said to be able to benefit from a hearing aid.

(*B. B. Schlanger*)

Hearing Psychology

BROADBENT, D. E. Some clinical implications of recent experiments on the psychology of hearing. *Proc. roy. Soc. Med.*, 48, 1955, 961-966.

The author discusses some practical applications of information derived from research on binaural hearing, auditory fatigue, and perception of barely detectible auditory stimuli.

(*F. L. Darley*)

Hearing Testing

FLOTTORP, G. Experimental sound levels during voice tests. *Acta Otolaryng.*, 45, 1955, 323-338.

The author investigated the use of the conversational and whispered voice in tests of hearing in Norway. Twenty-one trained examiners administered the tests. A calibrated microphone was placed in the position usually occupied by a patient. Sound level recordings were made during the test administration. A physical analysis of the test results indicated that there was a general tendency for the examiners to raise their voices when the distance from the microphone increased. Female examiners proved to be more efficient than male examiners. It was also noted that the intensity of the whispered voice was very easily influenced by the choice of words. It was suggested that the use of PB words would overcome such a difficulty. The author concludes by stating that the voice and whisper tests should not be used as objective tests of hearing.

(*J. J. O'Neill*)

MOSHER, W. E. and MAINES, A. F. A screening program for the detection of hearing loss in preschool children. *Amer. J. publ. Hlth.*, 45, 1955, 1101-1108.

The hearing screening program of the Erie County (New York) Department of Health is described. A pure tone sweep check was used, from 256 to 4096 cps, in the testing of over 5,000 preschool children. Methods of contracting the parents, test results, and follow-up results are discussed.

(*W. L. Thurman*)

Impedance of Skull

Corliss, E. L. R. and Koidan, W. Mechanical impedance of the forehead and mastoid. *J. acoust. Soc. Amer.* 27, 1955, 1164-1172.

This paper reports preliminary results of mechanical impedance measures of the forehead and mastoid of from six to nine subjects. The data are to be used to derive the parameters for a bone-conductor calibrating unit. Instrumentation and techniques are described for the determination of the resistive and reactive components of the human head and mastoid. The acoustic properties of the head are described in terms of a spring stiffness, two masses, and two damping components.

(*C. N. Hanley*)

Intelligibility

Moser, H. M. and Dreher, J. J. Effects of training on listeners in intelligibility studies. *J. acoust. Soc. Amer.*, 27, 1955, 1213-1219.

Six hundred monosyllables containing one to six speech sounds were presented in noise to 12 subjects. This was followed by alternate training and testing sessions at weekly intervals. The results indicate that when subjects are unfamiliar with the material, intelligibility varies inversely with the number of sounds in the word. After training, intelligibility scores improve progressively, preserving the same order of difficulty except that words containing two sounds become most intelligible. Currently used PB lists are analyzed for the number of speech sounds per word, and predictions about intelligibility are made and corroborated by test. The authors conclude that listener training is a primary variable in intelligibility testing, and consider saturation training mandatory with small groups. Implications for military and audiological applications are discussed.

(*A. J. Berlin*)

Over, H. J. Relative intelligibility of speech recorded simultaneously at the ear and mouth. *J. acoust. Soc. Amer.*, 27, 1955, 1207-1212.

In this study a comparison was made of the intelligibility of speech signals recorded simultaneously at the positions of the lips and left ears of six speakers. The samples of speech picked up at both positions were reproduced for a group of listeners at S/N ratios of −12, −15, and −18 db. The results of these listening tests indicated that: (1) the speech signals picked up at the ears were more intelligible than those simultaneously recorded at the mouth at each of the S/N ratios, (2) the intelligibility decreased with increasing noise for signals of both origins, and (3) the intelligibility scores for the mouth signals decreased much more rapidly than the intelligibility scores for ear signals.

(*B. B. Schlanger*)

Intensity DL

Flanagan, J. L. Difference limen for the intensity of a vowel sound. *J. acoust. Soc. Amer.*, 27, 1955, 1223-1225.

A pilot experiment to determine just discriminable differences in the intensity of a synthetic vowel is described. Two trained listeners judged pairs of one-second vowel samples, one of constant intensity and the other randomly varied above and below the standard. Three different time spacings were used between samples. Errors in judgment related to the spacing duration (time errors) are described and compared with similar reports for pure tones. The median value for the DL is 1.5 db and the DL is never less than 1.2 db.

(*A. J. Berlin*)

Language Origin

Baker, S. J. The instinctual origin of language. *J. gen. Psychol.*, 53, 1955, 305-328.

The author discusses his thesis that language is instinctual in origin.

(*J. J. O'Neill*)

Listening

Hollow, Sister M. K. Listening comprehension at the intermediate grade level. *Elem. Sch. J.*, 56, 1955, 158-161.

A comparison was made between a group of children who were given training in listening comprehension and a control group. Two alternate forms of a listening-comprehension test were devised and refined. After six weeks of training in the development of basic listening skills, the experimental group improved significantly over the control group on the basis of this test. Positive correlations were found between listening-comprehension scores and scores attained on achievement and intelligence tests. Sex differences, family size, and televiewing did not seem to be related to listening ability.

(*B. B. Schlanger*)

WALLERSTEIN, H. An electromyographic study of attentive listening. *Canad. J. Psychol.*, 8, 1954, 228-238.

Two groups of subjects were asked to listen to three successive presentations of a recorded detective story and a philosophical essay in order to investigate muscular activity during sustained attention. The results are reported as showing that rising gradients of tension from the forehead to the chin are demonstrated throughout the course of listening. Listening to the story is said to have produced increases of greater magnitude than listening to the essay. Forearm muscles reportedly failed to show any clear variations during listening. The rising gradients of muscle tension are associated by the author with increased comprehension of incoming material which takes place during attentive listening.

(*J. G. Sheehan*)

Loudness

MICHELS, W. C. and DOSER, B. T. Rating scale method for comparative loudness measurements. *J. acous. Soc. Amer.*, 27, 1955, 1173-1180.

The authors report the application to the problem of loudness judgment of a recently developed comparative rating scale method. Comparative loudness ratings on a seven-point scale, made by 36 college students, indicated that the method 'may be applied to loudness judgments with profit.'

(*W. R. Tiffany*)

Mandibulo-Facial Dysostosis

MCKENZIE, J. and CRAIG, J. Mandibulo-facial dysostosis (Treacher Collins syndrome) *Arch. Dis. Childh.*, 30, 1955, 391-395.

The literature is briefly surveyed and a typical case of the Treacher Collins syndrome is described. A new suggestion is offered regarding the cause of the abnormality: a defect of the stapedial artery.

(*F. L. Darley*)

Neurosurgery

SCARFF, J. E. Fifty years of neurosurgery, 1905-1955. *Int. Abstr. Surg.*, 101, 1955, 417-513.

This paper constitutes a review of the development of neurosurgery, with sections on brain-mapping and the surgical treatment of the dyskinesias. A 499-item bibliography is included.

(*F. L. Darley*)

Occupational Deafness

GOLDENER, A. I. Occupational deafness. *Arch. ind. Hlth.* 12, 1955, 643-656.

This paper presents an over-view of the etiology, pathology, and clinical aspects of occupational deafness arising from acoustic trauma. A thorough consideration is given the medico-legal aspects of occupational deafness.

(*C. N. Hanley*)

Only Child

CLARK, R. A. and CAPPARELL, H. V. The psychiatry of the adult only child. *Amer. J. Psychother.*, 8, 1954, 487-499.

Forty psychiatric clinic and in-patients who were only children were studied. A very frequent finding which appeared in only children was a varying degree of isolation from children near their own age. The only child who has a psychiatric condition is said to be frequently a peripheral person, who has great difficulty in feeling accepted in any group.

(*J. G. Sheehan*)

Overload Thresholds

LAWRENCE, M. and YANTIS, P. Thresholds of overload in normal and pathological ears. *Arch. Otolaryng., Chicago*, 63, 1956, 67-77.

'By employing the overload threshold measurement technique in abnormal ears it is shown that pathology of the middle ear, while affecting sensitivity, does not alter the very linear characteristics of the conductive mechanism. On the other hand, pathology of the inner ear produces a marked restriction of the hearing range from threshold to overload. The technique of measuring the threshold of aural overload provides a quantitative measure of audible distortion, and the significance of its presence in various inner-ear pathologies is presented.'

(*Authors' precis*)

Perstimulatory Fatigue

EGAN, J. P. and THWING, E. J. Further studies on perstimulatory fatigue. *J. acoust. Soc. Amer.*, 27, 1955, 1225-1226.

Three preliminary studies of the measurement of auditory adaption are reported, involving the use of loudness balance and localization. Simultaneous dichotic loudness balance shows the greatest amount of adaptation, while neither the localization method nor alternate loudness balance appears to measure adaptation. The effect of phase relationships in simultaneous dichotic loudness measurements of adaptation is also reported.

(*A. J. Berlin*)

Phonemic Confusions

Moser, H. M. and Dreher, J. J. Phonemic confusion vectors. *J. acoust. Soc. Amer.*, 27, 1955, 874-881.

Listeners and talkers representing 27 different countries were employed in this research in order to investigate intra-ensemble intelligibility errors. Listeners were trained, for a period of 8-to-10 hours, to transcribe the ICAO and US-UK alphabets in a noise environment. Experimental test periods, which then followed, lasted about 50 minutes per day. One-hundred db of fairly flat spectrum noise was mixed with speech in PDR-8 binaural headsets. Five S/N ratios, 0, −5, −10, −12, and −16 were used. Analyses of the responses to the alphabet stimuli reveal that '. . . . confusion seems to hinge on the accented vowel, and these confusions are stratified according to the articulatory position of the vowel.' The data also show greater discrimination for front vowels than back and less intra-ensemble confusion for low articulatory positions. The authors present a technique for computing confusion vectors along with a rationale for increasing the phonemic stability of any particular set of words.

(*C. N. Hanley*)

Phonics and Reading

Mulder, R. L. and Curtin, J. Vocal phonic ability and silent—reading achievement: a first report. *Elem. Sch. J.*, 56, 1955, 121-123.

Sixty-three fourth grade children listened to a tape-recording of one-syllable words whose phonetic elements were separated by a one second pause. Poor readers were found deficient in the ability to synthesize phonetic elements of words into meaningful word patterns. It is thought that this deficiency may be attributed to lack of training in auditory discrimination or in phonics. Related areas of investigation are suggested.

(*B. B. Schlanger*)

Pitch

Bachem, A. Absolute pitch. *J. acous. Soc. Amer.*, 27, 1955, 1180-1185.

A discussion of the results obtained from a previous study of 96 cases of absolute pitch is presented. Three classifications for superior skills in pitch discrimination are offered: (1) Pseudo-absolute pitch is considered a relatively common skill in judgment about piano or other musical notes that depends upon the presence of a comparison note and reflects considerable learning; (2) Quasi-absolute pitch is considered a skill in judgment about musical notes that depends upon memory, frequently requires retrials, and also apparently involves considerable learning; (3) Absolute pitch is fast, decided, certain; is independent of the instrument used, and usually extends over the complete musical scale. According to the author, the first two skills are understandable on the basis of Helmholtz's resonance theory. Absolute pitch, however, is thought to involve further complicated integrations of cortical activities.

(*F. B. Robinson*)

Play Therapy

Hellersberg, E. F. Child's growth in play therapy. *Psychoanal. Rev.*, 9, 1955, 484-502.

The author states that to understand the full meaning of play therapy for the child's total growth more attention should be paid to the sensory, and particularly, tactile, explorations of the child. By concentrating on the child's motor activity the author aims at a more effective use of psychoanalytic discoveries. He believes that verbal interpretation is of minor importance for a child's therapeutic progress. Most important in treating a neurotic child is the therapist's enlightened and alert responsiveness to every single movement of the child. There is special stress on exploration, which the author feels is a manifestation of the growth impulse dormant in every living organism. Two case histories are included and evaluated. The emphasis is on rebuilding contacts with the outer world, using the therapist as the foundation of the rebuilding process.

(*J. G. Sheehan*)

Psychotherapy

Goldstein, K. The concept of health, disease, and therapy; basic ideas for an organ-

ismic psychotherapy. *Amer. J. Psychother.*, 8, 1954, 745-764.

The concepts of health, disease, and therapy which are presented originated from the author's work with patients with chronic diseases of the nervous system or damage of the brain. His approach is termed 'organismic' he discusses the usually distinguished appearances of disease from this point of view.

(J. G. Sheehan)

Respiration Onset

FRASER, J. S. A study of the onset of respiration in the newborn. *Arch. Dis. Childh.*, 30, 1955, 546-547.

The onset of respiration was observed in 190 births. Four types of delivery were involved, namely, spontaneous (125), forceps (35), Caesarean (20), and breech (10). The gasp or lower medullary was the most frequent type of onset in all modes of delivery (total 169). No cases were seen where normal quiet respiration occurred from the onset, signifying that the centers above the pons were not functioning. In all cases studied, a degree of anoxemia was present, extending to various levels of the brain. The delay of onset of respiration was greater in the abnormal types of delivery, due probably to cerebral edema and hemorrhage.

(F. L. Darley)

Retarded Children

LUBMAN, C. G. Speech program for severely retarded children. *Amer. J. ment. Def.*, 60, 1955, 297-300.

The author discusses the results of an itinerant type of speech therapy program for mentally deficient children. A total of 93 children participated in the program. After six months of speech therapy, the speech of the children was judged by the speech therapist, teachers, and the parents of the children. Sixty-two of the children were judged as having made some speech improvement. An evaluation of the results indicated that the older children (17-21 years of age) did not learn as rapidly as the younger children. Mongoloid subjects were said to show more rapid and permanent improvement than brain damaged subjects.

(J. J. O'Neill)

Schizophrenia

WILCOX, D. E. Observations of speech disturbances in childhood schizophrenia. *Dis. nerv. Syst.*, 17, 1956. 20-23.

The literature is briefly reviewed and three cases are presented illustrating the speech disturbances prominent in the symptomatology of childhood schizophrenia ('mutism, infantile speech, neologisms, substitutions, generalizations, restrictions, disturbances of speaking tone and inflection'). The author presents the hypothesis that the child's language disorder serves as a defense for both child and parent. 'One is impressed with the lack of fluidity and communication in the constellation as a whole. Clear expressions of feeling, either loving or hostile, are rare . . . The parent-child relationship takes on the character of a prolonged truce between individuals who fear both their affections and their antagonisms . . . The speech pathology represents the resultant of psychological forces in the parent-child relationship, with both parent and child sharing the etiology.'

(F. L. Darley)

Sensitivity of the Ear

MOWBRAY, G. H., GEBHARD, J. W., and BYHAM, C. L. Sensitivity to changes in the interruption rate of white noise. *J. acoust. Soc. Amer.*, 28, 1956, 106-110.

The authors present new measurements on the differential sensitivity of the ear to intermittent random noise. Difference-limens were obtained at ten interruption rates between one and 320 cps. The duty cycle of the noise was 0.5 and the sound pressure level was 75 db. According to the authors, the results indicated that '. . . the ear has an appreciable differential sensitivity to intermittency to at least 320 cps, and there is no reason to believe that it stops there.' Delta F is shown to be a monotonically increasing function of frequency. 'When the data are plotted with logarithmic coordinates, two functions are revealed, suggesting a change in the method of frequency discrimination at about 5 cps. This change appears due to the listener's ability to count the noise bursts from 1 to 5 cps. but not above about 5 cps.'

(W. R. Tiffany)

Side-Tone

BLACK, J. W. Studies of delayed side-tone. *Contributi Del Laboratorio Di Psicologia Pubblicazioni dell' Universita Cattolica del Sacro Cuore.* Milan, 49, 1955, pp. 23.

'Groups of experimental subjects read 5- and 10- syllable phrases in the presence of delayed side-tone. The range of delay was 0.00-0.30 sec., sampled at 0.03 sec. intervals. Criterion measures were obtained relative to rate of oral reading and vocal sound pressure level. The series of studies suggested that the effect of a side-tone that is delayed the approximate duration of a speech sound in normal reading (0.09 sec.) is significantly deterring to the rate of oral reading. Male and female readers responded differently to the testing conditions, the speech of the female readers being more severely retarded by delayed side-tone than the speech of the male readers. Five and 10- syllable stimulus materials yielded dissimilar results, the latter disturbing the reading processes more than the former. The rate with which 5-syllable phrases were read was not significantly affected when the delay-time exceeded the duration of a syllable.'

(*Author's precis*)

Simultaneous Speaking

POULTON, E. C. Simultaneous and alternate listening and speaking. *J. acoust. Soc. Amer.*, 27, 1955, 1204-1207.

'Listening and speaking simultaneously was compared with listening and speaking alternately. The presented message was masked by the subject's voice to approximately the same extent in the two cases. Results: the simultaneous condition gave more errors than the alternate condition. In learning to repeat back what they heard in the simultaneous condition, all subjects initially tried to repeat what they heard *as* they heard it. They thus made meaningless sounds, without being aware that they were doing so.'

(*Author's precis*)

Speech Improvement

MECHAM, M. J. The development and application of procedures for measuring speech improvement in mentally defective children. *Amer. J. ment. Def.*, 60, 1955, 301-306.

A battery of tests was developed to measure selected aspects of the speech of mentally deficient children. These included tests of articulation, auditory discrimination and auditory memory span, and various aspects of oral language development. The test battery was administered to 21 children with IQs from 41 to 75 and a control group of subjects matched in terms of chronological age, IQ, and sex. After initial testing, the experimental group participated in an eight week program of speech therapy. Re-test results indicated that the experimental group made significant gains in all of the areas under study while the control group showed significant improvement only in auditory memory span. An evaluation of the test results for the experimental group revealed significant correlations between the tests of auditory discrimination and auditory memory span. There also were significant correlations between IQ and articulation scores, and between chronological age and auditory memory span.

(*J. J. O'Neill*)

Stapes Mobilization

ROSEN, S. Mobilization of the stapes. *Volta Review*, 57, 1955, 433-435, 450-451.

An operation for mobilizing the rigid stapes in otosclerotic conditions is described. In a simple procedure taking about twenty minutes, the ear drum is lifted and pressure is exerted on the neck of the stapes with a fine instrument called the mobilizer. The author, who also developed the technique, claims restoration of hearing in over fifty per cent of those suited for the operation. The author reports that in cases of failure, hearing is not made worse and fenestration may still be considered.

(*F. B. Robinson*)

ROSEN, S. and BERGMAN, M. Functional goals in mobilization of the stapes. *Arch. Otolaryng., Chicago*, 63, 1956, 11-20.

General auditory goals of the stapes moblization operation (Rosen technic) are described, utilizing case reports and audiometric fndings with both pre- and post-operative examination. It is stressed that audiometry is one of the essential means of case selection. The authors note that mobilization affords more frequent and greater degrees of (auditory) success than does the fenestration operation.

(*J. M. Palmer*)

Stuttering

FROESCHELS, E. The core of stuttering. *Acta Otolaryng.*, 45, 1955, 115-119.

The author discusses the cause and the course of stuttering and develops the viewpoint that stuttering is a psychoneurotic condition due chiefly to environmental influence. Every stage in the clinical picture is said to be caused by the patient's belief in his inability to speak normally. Thus, stuttering is said to be provoked and maintained by a wrong idea. Replacing the mistaken idea by an explanation of the ease of speech is offered as the logical way to achieve a successful treatment.

(*W. R. Tiffany*)

Therapy Techniques

HAHN, E. Role-playing, creative dramatics and play therapy in speech correction. *Speech Teacher*, 4, 1955, 233-238.

Three speech retraining techniques are presented as revisions of the often used game-drill procedures. Role playing, creative dramatics, and play therapy are discussed, differientiated, and evaluated as aids in speech therapy. Brief examples of the use of each technique are presented.

(*W. L. Thurman*)

Vital Capacity

JONES, H. E. The vital capacity of children. *Arch. Dis. Childh.*, 30, 1955, 445-448.

Three hundred and twenty-four boys and 301 girls aged six to 13½ years, without respiratory disease, made four trials, attempting maximum inspiration and expiration, on a Benedict-Roth type of spirometer. Norms (means) are given by sex, age (in six-month periods), weight, height, and body surface area. No evidence was found that children who have had pneumonia have a lower vital capacity than those who have not.

(*F. L. Darley*)

Vocal Analog

HOUSE, A. S. and STEVENS, K. N. Auditory testing of a simplified description of vowel articulation. *J. acoust. Soc. Amer.*, 27, 1955, 881-887.

An electrical vocal tract analog was utilized to produce vowel-like stimuli which were presented to two groups of listeners for identification. A forced-choice method of response was employed with one group; the other group heard the same vowel-like phonemes and could assign each to one of nine vowel phonemes or to an additional category *X* which indicated that the sound was judged not to be a member of any one of the nine possible vowel choices. 'Articulatory configurations of the vocal tract are specified by means of three numbers: the position of the point of greatest constriction, the degree of constriction at that point, and the size of the mouth opening.' The intensity, duration, inflectional characteristics, start-stop characteristics and fundamental frequency of the stimuli were made as similar as possible for all stimuli. The results show general agreement with previous data and seem to demonstrate the 'adequacy of the three-number articulatory description.'

(*C. N. Hanley*)

Voice

VAN DEN BERG, J. On the role of the laryngeal ventricle in voice production. *Folia phoniatr., Basel*, 7, 1955, 57-69.

The author discusses evidence regarding the function of the laryngeal ventricle in voice production. Evidence is cited not only to disprove the theory of Savart and Guillemin that the laryngeal verticle forms the main voice organ proper, but also to refute the theory of Negus who considers that it has no function at all. Tomograms illustrate ventricular variations during phonation. 'The spectrum of the frequencies at the input of the vocal cavities appears to depend on the dimensions of the ventricle and the passage between the ventricular bands.'

(*A. J. Berlin*)

BLACK, J. and GEMELLI, A. The voice in the reading of Italian phrases. *Contributi Del Laboratorio Di Psicologia, Pubblicazioni dell' Universita Cattolica Del Sacro Cuore*, Milan, 49, 1955, pp. 7.

'Oscillographic recordings of the readings of 20 ten-syllable phrases indicated that female students of a university of Milan read more slowly than the male students. Comparisons with available data of the typical reading voices of university students in the United States suggest that the Italian female students speak with lower fundamental frequency than do similar students in the United States, and that the Italian

male students speak with higher fundamental frequency than do their counterparts in midwestern United States.'

(*Author's precis*)

Vowel Matching

ATKINSON, C. J. Supplementary report No. 2. Vowel matching experiment. SC contract DA—36-039 SC 63-144, August 23, 1955, State University of Iowa.

Five vowels at three loudness levels were recorded by 21 speakers who matched the loudness of their own voice as played back over a loudspeaker. In one experiment the speaker adjusted his voice level to match the playback output. In the second experiment the speaker adjusted the loudspeaker level to the loudness level of his voice. The results indicated that (1) in both experiments the talker-produced vowel was consistently higher in sound pressure level, (2) reliability varied with loudness level and vowel characteristics, and (3) there was less reliability in the matches of the second experiment. In a third experiment, wider frequency range in the filter band-pass was responded to with more energy in the matching voice. A discussion of possible mechanisms that might operate to produce the obtained results is included.

(*B. B. Schlanger*)

Vowels of Italian

BLACK, J. and GEMELLI, A. Notes on Italian vowels. *Contributi Del Laboratorio Di Psicologia, Pubblicazioni dell' Universita Cattolica Del Sacro Cuore,* Milan, 49, 1955, pp. 4.

'Samples of three Italian vowels [i, a, u] as read in monosyllables by male and female speakers were measured from oscillographic recordings. The vowel [a] was significantly lower in fundamental frequency and significantly longer in duration than the other two. Power level tracings of the syllables did not reveal significant differences among the vowels in relative sound pressure level.'

(*Author's precis*)

News And Announcements

A nationwide shortage of trained workers is preventing the benefits of modern rehabilitation reaching vast numbers of the nation's disabled. This was one of the conclusions in a report released February 10, 1956 by the Health Resources Advisory Committee of the Office of Defense Mobilization. Representing Speech and Hearing on the Committee, Darrel J. Mase, Coordinator of the Florida Center for Clinical Services, University of Florida, reports that the past ten years have shown a tremendous increase of interest in the paramedical fields. There has been a special increase in the field of speech and hearing therapy, as revealed in membership figures of the American Speech and Hearing Association. In 1944, there was a total membership of 584; in 1955 a total membership of 3,660. Both figures include associate members.

Although professional standards of training and employment have improved steadily, the demand for trained speech and hearing personnel far exceeds the supply. The ASHA committee on the Mid-Century White House Conference estimated that 15,000 speech and hearing therapists were needed. With our present population figures that estimate would be 16,500. A conservative estimate of those needing help with speech and hearing is 5% of the population. Personnel to staff university and college programs are most inadequate. One-third of ASHA members are in the public schools.

The growth of new training programs has been phenomenal in the past few years. A United States Office of Education study shows that in 1949 there were 66 institutions training personnel to work with the speech handicapped, 25 to work with the hard of hearing, and 17 to work with the deaf. By contrast the same study shows that in 1953-1954 there were 115 colleges and universities reporting a sequence of courses for training in the area of speech handicaps, 68 in the area of the hard of hearing, and 22 in the area of the deaf. The majority of the 115 training centers are graduating individuals to meet minimal requirements for basic certification (M.A. or less) in the ASHA. Many of these centers must necessarily remain at this level. There is need to strengthen many of these centers and to expand a limited number to meet adequately the requirements for advanced certification at the doctoral level. American Speech and Hearing figures also suggest that most of the training programs are in speech correction, since there are very few individuals with basic or advanced hearing credentials who are working in colleges or universities.

Lack of Federal and/or private financial assistance explains the lag in advanced training for workers in both the fields of speech and hearing. Few scholarships are available to advanced students aside from the student assistantships offered by clinics and universities. The United States Public Health and the Children's Bureau, the National Society for Crippled Children and Adults and its state societies, the American Speech and Hearing Association, and The United Cerebral Palsy Association are organizations with current but limited programs for assisting those seeking professional training.

The subcommittee on Paramedical Personnel in Rehabilitation and Care of the Chronically Ill recommends that the ASHA be encouraged to establish a full-time, permanent staff to solicit financial assistance from appropriate sources at the appropriate time. The experience of related professions indicates that professional growth and status is achieved rapidly following such action. Recruitment, which is an ever present problem, could be greatly assisted through such a central office.

A speech and hearing therapy program was inaugurated in Alaska this winter on a demonstration basis in the communities of Juneau, Sitka, and Ketchikan. The work is under the direction of the Alaska Department of Health in cooperation with chapters

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News and Announcements is edited by Mary W. Huber, Los Angeles State College, assisted by the following committee: Sue Earnest, San Diego State College; Lester L. Hale, University of Florida; Henry Moser, Ohio State University; Severina Nelson, University of Illinois; Max Nelson, Michigan State College and (in this issue) Robert Gillen, Los Angeles State College.

of the Alaska Crippled Children's Association in the three communities. Mrs. Henrietta Krantz joined the Alaska Health Department staff to carry on the program. Mrs. Krantz was previously Assistant Professor of Speech at the University of Hawaii where she worked with the Teachers' College Speech program and the University Speech Clinic.

The Office of Education of the United States Department of Health, Education and Welfare announces the appointment of seven persons to fill vacancies as a part of a program to strengthen services to education in areas for which the Office has lacked sufficient personnel. Among these new specialists are Dr. Viola Cassidy, of Columbus, Ohio, to serve as Consultant in the Education of the Mentally Handicapped; Miss Ellyn G. Lauber, of Vineland, N. J., as Research Assistant for Education of the Mentally Retarded; Dr. Ellsworth Scott Obourn, of Clayton, Mo., to be Specialist in Science Education and Dr. Myrtle M. Imhoff, of Long Beach, California, to serve as Specialist in Early Elementary Education.

Dr. Mary E. Switzer, United States Director of Vocational Rehabilitation, has announced a Federal special project grant of $17,200 to the National Association of the Deaf. The grant is for a study of the conditions affecting occupational competence and success among deaf adults in the United States. The study will be under the direction of Dr. Irving S. Fusfeld, Vice President of Gallaudet College. The study will be conducted by the deaf themselves. State organizations of the deaf will cooperate in the undertaking.

The National Health Council has announced establishment of a special committee on neurological disability as one of its major projects for the year. The action was taken at a meeting of the Council's Board of Directors, following a report of the first 'National Conference of Neurological Disability as a National Problem' held in December, 1955, at Arden House, Harriman, N. Y. The Arden House conference brought together 50 of the nation's leading specialists most directly concerned with various aspects of the problem. Lawrence J. Linck, retiring executive director of the National Society for Crippled Children and Adults, is a member of the committee responsible for developing plans for further action in accordance with the recommendations of the conference. He is also planning the production and distribution of publications from that meeting.

An exhibit, 'Hearing — Man's Second Sense,' has been donated to the Cleveland Health Museum by the Ohio Bell Telephone Company. The exhibit depicts the story of Alexander Graham Bell's contributions to communication. It gives the visitor an opportunity to hear his own voice and to screen his hearing.

The Bureau for Speech Improvement of the Board of Education of New York City announces the celebration of its 40th anniversary. Organized in 1916 with a staff of six teachers and a director, the Bureau now sponsors corrective speech work by 124 special teachers of speech improvement in 584 elementary and junior high schools, and in its seven special centers for the severely speech handicapped and cerebral palsied children. Speech correction and speech arts classes are also held in the city's 86 high schools which command the services of twenty-three speech chairmen and 214 speech teachers, and involve approximately 40,000 pupils. Dr. Letitia Raubicheck was appointed Director of Speech Improvement in 1929.

Charles R. Elliott, formerly Associate Director of the Speech Clinic, Northwestern University, has been appointed Assistant Professor of Clinical Speech Pathology in the Department of Otolaryngology, College of Medicine, University of Illinois and Speech Pathologist to the Cleft Palate Center in the Division of Services for Crippled Children. Professor Elliott succeeds Dr. Herbert Koepp-Baker who is now Director of Special Education at Western Carolina College, Cullowhee, North Carolina.

The National Institute of Mental Health, a division of the National Institute of Health of the Public Health Service, has awarded a three year research grant to the State University of Iowa. D. C. Spriestersbach is project director. The project is concerned with the investigation and description of factors related to the adjustment of cleft palate individuals. A coded case history,

similar to that used in a recently completed study of the onset of stuttering at the State University of Iowa, is being used in studying 150 children with cleft lips and/or palates and their parents.

Sara Stinchfield Hawk and Alice W. Mills announce the opening of offices for private practice in Speech Therapy at Glendale, California.

The American Association of Rehabilitation Therapists has created a registry of Medical Rehabilitation Therapists and Specialists. This is an attempt to place in one central file the records and transcripts of all occupational therapists, physical therapists, speech therapists and persons working in medically asosciated clinics, so that these qualifications may be subject to review by physicians and others. A certificate and a suitable lapel emblem is given the individual who completes the qualifications of the registry. Individuals interested in the registry should contact Mr. Joseph F. Harris, 6241 Hallwood Road, Verona, Pa.

Special Summer Programs

The second annual workshop in speech problems in cerebral palsy, sponsored by Orthopaedic Hospital in Los Angeles will be held July 9-20, 1956. Among those participating will be Harry Bice, Consulting Psychologist, New Jersey Crippled Children's Commission. The workshop can be taken for 2 units of graduate credit at the University of Southern California. Address inquiries to Robert Harrington, Orthopaedic Hospital, 2400 S. Flower Street, Los Angeles 7, California.

Jane Beasley, Research Associate with the Horace Mann-Lincoln Institute Talented Youth Project, Columbia University Teachers College, will be guest lecturer at the University of Southern California School of Education for the regular six weeks summer session. Dr. Beasley will be teaching courses in Child Psychology and Exceptional Children; she will also address members of the ASHA in southern California at their summer get-together.

Charles Van Riper will be visiting lecturer and consultant for the Workshop in Stuttering at Southwest Texas State Teachers College, San Marcos, Texas, June 5-23, 1956. A limited number of persons of high school age or older who stutter will be accepted for residence on the campus. Qualified speech therapists enrolled for the workshop with Dr. Van Riper will give group and private therapy to the stutterers throughout the six weeks under the supervision of Empress Y. Zedler and Mrs. Olga Dominquez.

Representatives of the Bell Telephone Laboratories will demonstrate factors in the analysis and synthesis of speech as part of the Wisconsin Institute in Speech, Friday, August 3, 1956.

Calvin W. Pettit, of George Washington University, will be acting Director of the Speech Clinic at Wisconsin this summer. Special clinics to be offered will be the Cleft Palate Clinic, the Delayed Speech Workshops, the Stuttering Clinic, the Cerebral Palsy Clinic and the Hearing Clinic. For information write to Dr. John V. Irwin, Speech Clinic, University of Wisconsin, Madison, Wisconsin.

On June 22 and 23, the University of Iowa Council on Speech Pathology and Audiology will sponsor a Conference on Clinical Problems in Speech Pathology and Audiology with special emphasis on the applications of past and current research in language development and in stuttering. The conference will feature lectures by nationally-known leaders and panel discussions in which audience participation will be invited. For detailed information write to Dr. Frederic L. Darley, Speech Pathology and Audiology, State University of Iowa, Iowa City, Iowa.

As a feature of its summer session program, the State University of Iowa Council on Speech Pathology and Audiology is sponsoring a two-weeks workshop beginning on June 25. This workshop is designed to meet the needs of speech correctionists and hearing therapists who are confronted with practical problems in public school situations. Course instructors will be Charles D. Parker, James L. Shapley of the State University of Iowa Speech Pathology and Audiology staff and Mrs. Dorothy Craven, Assistant Director of the Speech Clinic, University of Maryland. For further de-

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tails write to Dr. Charles D. Parker, Speech Pathology and Audiology, State University of Iowa, Iowa City, Iowa.

Wendell Johnson will be a visiting professor at the University of Colorado at Boulder during the 1956 summer session.

In cooperation with the Division of Services for Crippled Children, University of Illinois, the Rockford College Summer Speech Center will hold its fourth annual Workshops for Mothers of Cleft Palate Children from July 22-28. The resident program of the Summer Center is limited to cleft palate children. Last summer, 51 children with palatal clefts were in residence for the 6½ weeks' session.

On June 21-22, a Special Education Conference will be held on the campus of the University of Missouri in Columbia. This conference, sponsored jointly by the College of Education and the Adult Education and Extension Service of the University, will provide special opportunities for teachers and administrators interested in special education. The program includes study of the speech handicapped, the deaf and hard of hearing, the blind and partially sighted, the gifted, those with social and emotional problems, and the orthopedically handicapped. Lectures and discussion groups will be scheduled at the Memorial Student union. Those concerned with special education in Missouri and other states are invited to attend.

Los Angeles State College is presenting the West Coast Symposium on Hearing for three weeks, June 18 to July 6, featuring lectures by leading authorities in the United States. The major portion of this symposium will follow the meeting of the Alexander Graham Bell Association, June 18-22. A Workshop in Eurythmics for Deaf Children, June 25-29, will be offered in cooperation with the John Tracy Clinic. Jane Beasley of Columbia Teachers' College, part time visiting lecturer at Los Angeles State College, will present a course on the gifted child. For information on these and other special education offerings write to John Morton, Dean of Educational Services, 855 N. Vermont Ave., Los Angeles State College, Los Angeles 29, California.

Syracuse University will again provide a summer residence school for children with speech and hearing handicaps. A varied daily program is planned to include treatment, recreation, and free play periods. The residence school will be in operation from July 2 to August 10 inclusive. For information write to the Gordon D. Hoople Hearing and Speech Center, Syracuse University, 805 South Crouse Avenue, Syracuse 10, New York.

Speech and Hearing Therapy, Occupational Therapy and Functional Activities are offered to both children and handicapped adults at Camp Jened in Hunter, New York. Camping experience, adapted to the needs and physical capacities of the campers is a part of the camp activities. Speech and hearing therapies are coordinated with dramatics, music, and choral speaking. For information write to Leona S. Burger, 1434 Genesee Street, Utica 4, New York.

The University of Nebraska Speech and Hearing Laboratories will hold a daily summer speech clinic with special emphasis on preschool children, June 18 to July 13. For information write to John H. Wiley, University of Nebraska, Lincoln, Nebraska.

A Workshop in Speech Therapy for Teachers, Children and Parents is featured by Long Beach, California State College, June 18 to July 27. Children from 5 to 12 years will attend from 9:00 to 12:00 o'clock. Activities will include speech therapy, creative dramatics, arts and crafts, speech reading and auditory training for the hard of hearing, rhythms, nutrition, and recreation. For information write to Mr. Ned Bowler, Speech Department, Long Beach State College, 6201 East Anaheim Road, Long Beach, California.

The Catholic University of America in Washington, D. C., is planning a Workshop on Mental Health and Special Education from June 15-26, 1956, in order to give teachers, principals, supervisors, and others an orientation in the field of special education and mental health. Lectures and seminars will be held on the mentally retarded, the speech defective, the cerebral palsied, the delinquent, children with reading difficulties, and other features of special education. Five of the outstanding psychiatrists

in the country will lecture on various phases of mental health. For further information write to the Director of Workshops, The Catholic University of America, Washington 17, D. C.

Northwestern University is planning a Symposium on Speech and Language Problems resulting from Neurological Disorders for the Summer Session of 1956. Also, Joseph M. Wepman will offer a course in Adult Aphasia.

Meetings Announced

American Speech and Hearing Association, November 19-21, 1956, The Palmer House, Chicago, Illinois.

Speech Association of America, December 27-29, Conrad Hilton Hotel, Chicago, Ill.

Alexander Graham Bell Association, June 18-22, 1956, Los Angeles, California. Sponsored by the John Tracy Clinic and the Mary E. Bennett School for the Deaf in Los Angeles.

The 10th International Congress for Speech and Voice Therapy, September 3-7, 1956, Barcelona, Spain. For further details apply to the Organizing Secretary: Dr. J. Perello, Provenza, 319 Barcelona, (9), Spain.

The Second Annual Conference on Reading at Concordia College, Moorhead, Minnesota, June 18-22.

Claremont Reading Conference, July 9-12, 1956, at Claremont College, California. Members of the California Speech Therapy Association, Southern Section, will participate.

Under the joint sponsorship of the Acoustical Society of America, the Air Force Cambridge Research Center, and interested departments and laboratories of the Massachusetts Institute of Technology, a four-day Seminar (June 11-14, 1956) and a two-day Conference (June 15-16, 1956) on problems of speech communication will be offered at the Massachusetts Institute of Technology. These events are scheduled in addition to sessions devoted to speech problems during the joint meeting of the Acoustical Society of America and the Second International Congress on Acoustics, taking place in Cambridge June 17-23, 1956. The basic theme of the Seminar is the contribution of acoustics, linguistics, psychology and information theory to our understanding of the nature of speech communication. It is to be conducted in a relatively formal manner, with lectures, demonstrations, laboratory visits, and organized discussions. The Conference will consist of three sessions on the following topics: (1) The measurement of the intelligibility of speech; (2) Recent advances in technical applications of speech research; (3) Contributions to the theory of speech communication. Further information may be secured by writing to Professor Morris Halle, Department of Modern Languages, Massachusetts Institute of Technology, Cambridge, Massachusetts.

New Materials

The first of a new series of ten Life Situation Lip Reading Films has been completed by the Speech and Hearing Clinic and the Department of Cinema, University of Southern California. These 16 mm. films in synchronized sound-color, when completed, will be available to interested schools and agencies. An orientation film for teacher groups to accompany the films is being planned when funds become available. University of Southern California will make these films available through the creation of the Boris V. Markovin Fund. Proceeds from the sale of the films will go towards research in lip reading using the life situation film technique. Inquiries may be directed to Milton Dickens, Head, Department of Speech, University of Southern California, Los Angeles 7, California.

The first two of a series of foreign language studies translated and distributed by the Beltone Institute for Hearing Research are available. The translation series are selected from original studies in the hearing field that are not available. Bio-electrical Analysis of the Function of the Intra-Aural Musculature by H. Bornschein and F. Krejci and Occupational Deafness from White Noise by Dr. Luigi Bernabei are available for professional and library use. They may be secured by writing the Beltone Institute for Hearing Research, 2900 West 36th Street, Chicago 32, Illinois.

Psychological Reports and *Perceptual and Motor Skills* present their selected monographs for 1955. Titles include the following: Perseveration, Rigidity, and Persistence

by Abraham S. Levine; Integration as a Basic Cerebral Function by Alan O. Ross; The Experimental Use of Electron micrographs as a Supplement to the Rorschach Ink Blot Technique by Dorothy Ransom; Perseveration or the Central Factor by Abraham S. Levine. Orders for individual monographs are $1.00 each. Published by Southern Universities Press, Station E., Box 1, Louisville, Kentucky.

The 1956 Index to the *Quarterly Journal of Speech* is available through the Wm. C. Brown Company, Publishers, 915 Main Street, Dubuque, Iowa for $5.00.

In January 1956, the American Psychological Association initiated publication of a monthly journal entitled *Contemporary Psychology: A Journal of Reviews*. The aim of this publication is to provide critical reviews of books in the broad field of psychology and related sciences. Subscriptions to *Contemporary Psychology* will be $8.00 a year (foreign subscriptions $8.50) with single issues priced at $1.00 each. Address American Psychological Association, 1333 Sixteenth Street, N.W., Washington 6, D. C.

The *Bulletin on Current Literature*, published since 1940 by the Library of the National Society for Crippled Children and Adults, has changed its title to *Rehabilitation Literature*, beginning with the January 1956 issue. As an Easter Seal Society service, *Rehabilitation Literature* will continue to be published monthly, and its subscription rate will be one dollar a year.

The Colorado Speech and Hearing Association has compiled information on therapists and agencies furnishing speech and hearing services in the Colorado area. This information will be available on request. Write Marion P. Downs, Vice-President, Colorado Speech and Hearing Association, University of Denver Clinical Services, University Park, Denver 10, Colorado.

A Full Range Picture Vocabulary Test by R. B. Ammons and H. S. Ammons is an individual test of intelligence based on verbal comprehension. It takes approximately five to ten minutes to administer, with norms for CA 2 through adult level. There are two forms (A and B). No reading or writing is required. The test with instructions, norms, and sample answer sheets cost $5.00 and may be ordered from Psychological Test Specialists, Station E, Box 1, Louisville, Kentucky.

Talking Time Filmstrips are designed to help improve speaking habits in children. More than 400 instruction frames make it possible to teach pupils an 'awareness' of sounds and how they are made. Imaginative sound poems are read and there are games to play that acquaint children with speech sounds. The filmstrips were developed by Louis Binder Scott, Consultant in Speech Education and Development, San Bruno Park, California Elementary Schools. Series I and II, $25.00 each are available from the Webster Publishing Company, Pasadena 2, California.

A film, *Teaching Speech After Laryngectomy*, prepared by the staff of the Gordon D. Hoople Hearing and Speech Center of Syracuse University, is available for distribution. For further information write Louis M. DiCarlo, The Gordon D. Hoople Hearing and Speech Center, Syracuse Universtiy, Syracuse 10, New York.

Graduate Assistantships, Fellowships and Scholarships

Clinical Assistantships. Syracuse University, $1,250 to $1,750 with six hours remitted tuition each semester. Write Louis M. DiCarlo, The Gordon D. Hoople Hearing and Speech Center, Syracuse University, Syracuse 10, New York.

Clinical Assistantships. Purdue University. Starting July, September, or February. Twenty hours per week of clinical assistance. $1,500 for regular school year (10 months), $1,800 for calendar year (12 months); waiver of tuition fees. Student may enroll for 10 hours of graduate course work per semester. Ten hours per week clinical assistantships also available. Student may enroll for 14 hours of graduate course work per semester. Address M. D. Steer, Speech and Hearing Clinic, Purdue University, Lafayette, Indiana.

Research Assistantships. Voice Science Laboratory, Department of Speech, Purdue University. Starting September or February.

Twenty hours per week of laboratory research assistance. $1500 for regular school year (10 months); waiver of tuition fees. Student may enroll for 10 hours of graduate courses per semester. Address M. D. Steer, Speech and Hearing Clinic, Purdue University, Lafayette, Indiana.

Teaching Assistantships. Department of Speech, Purdue University. Starting September or February. Half-time. Teach two sections of Principles of Speech or serve as drill-master for several sections of Voice, Articulation, and Verbal Skills, and serve as clinician in the Speech and Hearing Clinic. $1,500 for academic school year (10 months); waiver of tuition fees. Student may enroll for 10 hours of graduate courses per semester. Address A. H. Monroe, Department of Speech, Purdue University, Lafayette, Indiana.

Research Assistantships. University of Michigan. Speech Research Laboratory. Fall semester of 1956-57; $600 per semester. The assistantship is for a student who wishes to carry on graduate work with a major in speech science. Applicants should have some previous training and an interest in mathematics and physics. Responsibilities include laboratory work in electro-acoustics, and assistance with laboratory instruction in courses in experimental phonetics. Address: Gordon E. Peterson, Department of Speech, 3223 Angell Hall, University of Michigan, Ann Arbor, Michigan.

Graduate Assistantships. Speech Clinic, University of Michigan. 20 hours per week or less as assigned to one of the six service divisions of the clinic. Master's degree candidate $625; first year Doctoral candidate $700; second year Doctoral candidate $750 and third year Doctoral candidate $800 per semester. Prorated stipends are also available for the summer sessions. Applicants may express a preference for work in one of the following six divisions: Adults, Children, Dysphasia, Examining, Hearing, or Student Clinic.

Assistantships. Boston University, Speech and Hearing Center. Assistants participate in both diagnosis and therapy. Speech therapy and audiology. Remission of $600 tuition for full-time graduate study. Address Wilbert L. Pronovost, Director, Speech and Hearing Center, Boston University, Boston, Massachusetts.

Graduate Assistantships. University of Nebraska. In Speech and Hearing. Available beginning September 1956. $1,000 plus waiver of tuition. Applicants apply to Dr. Leroy T. Laase, Speech Department, University of Nebraska. Other special assistantships in hearing may be available.

Research Assistantship. University of Wisconsin. September 1956 through August 1957. In galvanic skin response audiometry with severely handicapped or disturbed populations. Annual stipened $1,620. Full facilities are available to implement the assistantship. Application should be made to John V. Irwin, Speech and Hearing Clinic, University of Wisconsin, Madison 6, Wisconsin.

Training Fellowships. Vanderbilt University School of Medicine. Starting September. Programs leading to the Master of Science degree in speech correction, audiology or teaching of hearing impaired children. Fellowships pay tuition and monthly stipend of $100-$130 for twelve months. Address Forrest Hull, The Bill Wilkerson Hearing and Speech Center, 2109 Garland Avenue, Nashville, Tennessee.